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EDITED BY

COLONEL W. H. HORROCKS,

ROYAL ARMY MEDICAL CORPS

ASSISTED BY

MAJOR C. E. POLLOCK,

ROYAL ARMY MEDICAL CORPS

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Journal

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Original Communications.

ANTELOPE INFECTED WITH *TRYPANOSOMA GAMBIENSE*.[1]

BY CAPTAIN A. D. FRASER, R.A.M.C., AND DR. H. L. DUKE.

THE Sleeping Sickness Commission of the Royal Society, Uganda, 1908-10, showed that waterbuck, bushbuck, and reedbuck could readily be infected with a human strain of *Trypanosoma gambiense*, and that clean laboratory-bred *Glossina palpalis* were capable of transmitting the virus from the infected antelope to susceptible animals.

In the present paper, observations which were made upon these antelope during the eight months subsequent to the Commission's departure from Uganda are recorded. Experiments are also described which show that the duiker—another species of antelope common in most parts of Uganda—can also be similarly infected with a human strain of *T. gambiense*. As regards the antelope employed by the Commission, six of the nine remained in apparently excellent health in April, 1911—roughly, a year after they were infected.

Until bushbuck 2428 escaped from the kraal, and bushbuck 2372 died three hundred and thirty-eight days after its infection as the result of an accident, they had also been healthy. A post-mortem examination was made immediately after death in the case of bushbuck 2372, but no evidence of trypanosomiasis was found.

Reedbuck 2427 appeared to be perfectly healthy for two hundred

[1] Reprinted from the *Proceedings of the Royal Society*. Series (B).

TABLE I.—GIVING THE RESULTS OF FEEDING LABORATORY-BRED *Glossina palpalis* ON ANTELOPE INFECTED WITH *T. gambiense*.

Experiment number	NUMBER OF FLIES		Number of days after original infection of antelope	Number of days flies fed on antelope	Number of days before flies became infective	RESULT		Length of experiment, in days	Remarks
	On 1st day	On 30th day				Positive	Negative		
					Bushbuck, Experiment 2328.				
7	?	?	134	5	25	+	..	32	Experiment carried out by Dr. van Someren.
215	115	79	202	10	..	..	–	79	
402	53	18	264	11	..	..	–	64	" Hereditary transmission " flies.
403	49	29	264	11	..	..	–	64	Control to Experiment 402.
538	21	16	306	7	..	..	–	48	" Hereditary transmission " flies.
539	39	31	306	7	..	..	–	62	Control to Experiment 538.
647	52	46	342	6	..	..	–	41	
					Bushbuck, Experiment 2371.				
89	?	?	126	3	50	+	..	59	Experiment carried out by Dr. van Someren.
216	90	64	173	10	..	..	–	78	
401	50	21	235	11	..	..	–	63	" Hereditary transmission " flies.
405	43	31	235	11	38	+	..	51	Control to Experiment 404.
543	33	17	279	9	..	..	–	60	" Hereditary transmission " flies.
544	71	44	279	9	..	..	–	60	Control to Experiment 543.
643	73	49	311	5	..	..	–	42	
					Bushbuck, Experiment 2372.				
88	?	?	123	3	39	+	..	48	Experiment carried out by Dr. van Someren.
218	72	59	171	9	34	+	..	47	
480	79	47	253	7	..	..	–	64	
607	85	61	298	8	25	+	..	33	
658	64	48	315	9	38	+	..	38	
					Bushbuck, Experiment 2428.				
106	?	?	116	2	..	..	–	67	Experiment carried out by Dr. van Someren.
222	20	20	164	9	40	+	..	49	

					Reedbuck, Experiment 2357.				
51	92	18	131	7	..	..	–	77	
189	101	62	173	11	44	+	..	59	
469	83	34	263	9	31	+	..	43	
528	41	20	288	8	..	..	–	57	"Hereditary transmission" flies.
529	70	55	288	8	34	+	..	43	Control to Experiment 528.
631	97	56	322	6	..	..	–	41	
669	119	63	336	12	..	..	–	35	
					Reedbuck, Experiment 2359.				
52	170	64	113	7	38	+	..	55	
190	89	76	155	11	32	+	..	44	
398	50	34	231	12	36	+	..	49	Control to Experiment 400.
400	49	13	231	12	..	..	–	63	"Hereditary transmission" flies.
530	54	19	270	8	..	..	–	61	
642	33	29	306	5	..	..	–	40	
					Reedbuck, Experiment 2427.				
97	60	53	117	8	34	+	..	46	
254	72	52	177	11	29	+	..	49	
					Reedbuck, Experiment 2431.				
98	81	41	119	7	32	+	..	43	
268	60	51	184	10	36	+	.	50	
399	43	29	224	12	..	..	–	63	Control to Experiment 401.
401	25	4	224	12	..	..	–	63	"Hereditary transmission" flies.
598	88	44	288	9	..	..	–	50	
656	66	30	306	11	..	..	–	40	
					Waterbuck, Experiment 2378.				
6	?	?	105	5	25	+	..	32	Experiment carried out by Dr. van Someren.
217	168	53	173	10	..	..	–	68	
406	54	0	237	9	..	..	–	19	
471	96	9	251	7	..	..	–	62	
488	45	28	259	8	..	..	–	59	
523	36	24	270	7	..	..	–	62	
622	62	15	306	7	..	..	–	42	

It will be noted that flies which were fed on bushbuck 2372, 315 days after it had been infected with a human strain of *T. gambiense*, became infected and successfully transmitted the disease to a healthy monkey.

Table II gives the results of the dissections of laboratory-bred *Glossina palpalis* which had fed on the infected antelope.

days after it had been infected. It then died suddenly. At the post-mortem examination performed immediately after death the prescapular glands were found to be the size of a hazel-nut. On section they were hæmorrhagic. There were numerous petechiæ on the mucous membrane of the mesentery. The mucous membrane of the fourth stomach also showed many petechiæ. Microscopical examination of smears made from the various organs was negative. It is, therefore, impossible to say what the cause of death was in the case of this buck.

With the view of ascertaining how long the antelope remained infected, investigations were carried out on the following lines:—

(1) Feeding laboratory-bred *G. palpalis* for several days on the antelope, and subsequently endeavouring to infect a healthy susceptible animal.

(2) Dissecting these flies and examining them for flagellates.

(3) Injecting blood of the buck into animals susceptible to *T. gambiense* infection.

Table I gives the detailed results obtained by the first of these methods. The number of days which elapsed from the date on which the buck was infected until the commencement of the experiment is given.

"Hereditary transmission" flies indicates that the flies before being put upon the antelope had been fed for thirty days upon healthy monkeys to ascertain if laboratory-bred flies which had never fed upon an infected animal could give rise to an infection. As it has been suggested that flies were most readily infected when their first feed was upon an infected animal, these flies were used with the view of obtaining evidence on this point, control experiments being at the same time made with laboratory-bred flies which had not fed before they were put upon the antelope. Although it will be noted that no infection occurred among the "hereditary transmission" flies, whereas the control flies sometimes became infected, the numbers of the flies used are too small to allow of any conclusions being arrived at.

The experiments recorded in Tables I and II are summarized and grouped in Table III according to the length of time the antelope had been infected.

It will be seen that positive experiments were obtained from all the buck (nine examined) when the flies were fed upon them before 200 days had elapsed from the date of the antelope's infection. When more than 200 days had elapsed four of the seven buck examined yielded positive results.

Table II.—Giving the Results of the Dissection of Laboratory-bred *Glossina palpalis* which had fed on Antelope infected with *T. gambiense*.

Experiment number	Number of flies used in experiment	Number of flies dissected	Number of infected flies found	Percentage of infected flies	Result of experiment	Remarks
Bushbuck, Experiment 2328.						
7	?	0	0	..	+	Flies not dissected.
215	115	79	0	..	–	
402	53	42	0	..	–	
403	49	42	0	..	–	
538	21	21	0	..	–	
539	39	33	0	..	–	
647	52	51	0	..	–	
Bushbuck, Experiment 2371.						
89	?	27	0	..	+	
216	90	61	0	..	–	
404	50	33	0	..	–	
405	43	41	0	..	+	
543	33	26	0	..	–	
544	71	66	0	..	–	
643	73	51	0	..	–	
Bushbuck, Experiment 2372.						
88	?	29	1	3·45	+	
218	72	37	1	2·7	+	
480	79	44	0	..	–	
607	84	70	1	1·4	+	
658	64	59	2	3·4	+	
356	36	36	0	..	–	Experiment lasted 12 days.
357	38	38	0	..	–	,, ,, 14 ,,
Bushbuck, Experiment 2428.						
106	?	14	0	..	–	
222	20	20	2	10	+	
Reedbuck, Experiment 2357.						
51	92	30	0	..	–	
189	101	46	4	8·6	+	
469	83	53	5	9·4	+	
528	41	31	0	..	–	
529	70	64	3	4·7	+	
631	97	77	0	..	–	
669	119	65	0	..	–	
Reedbuck, Experiment 2359.						
52	170	122	0	..	+	
190	89	61	5	8·1	+	
398	50	49	3	6·1	+	
400	49	40	0	..	–	
530	54	23	0	..	–	
642	33	30	0	..	–	
Reedbuck, Experiment 2427.						
97	60	27	1	3·7	+	
254	72	49	1	2·0	+	
322	28	28	0	..	–	Experiment lasted 9 days.
323	30	30	1	3·3	–	,, ,, 13 ,,
Reedbuck, Experiment 2431.						
98	81	8	0	..	+	
268	60	53	2	3·7	+	
399	43	36	0	..	–	
401	25	14	0	..	–	
598	88	45	0	..	–	
656	66	35	0	..	–	
Waterbuck, Experiment 2378.						
6	?	0	0	..	+	
217	168	53	2	3·8	–	
406	54	36	0	..	–	
471	96	18	0	..	–	
488	45	44	0	..	–	
523	36	31	0	..	–	
622	62	20	0	..	–	

TABLE III.—SUMMARIZING EXPERIMENTS OF TABLES I AND II AND GROUPING THEM ACCORDING TO LENGTH OF TIME THE ANTELOPE HAD BEEN INFECTED.

Species of antelope	Days after original infection of antelope	Number of experiments	Number of positive experiments	Number of Flies On 1st day	Number of Flies On 30th day	Number of flies dissected	Number of infected flies found
Bushbuck 2328 ..	100—200	1	1	?	?	0	0
,, 2371 ..	,,	2	1	?	?	88	0
,, 2372 ..	,,	2	2	?	?	66	2
,, 2428 ..	,,	2	1	?	?	34	2
Reedbuck 2357 ..	,,	2	1	193	80	76	4
,, 2359 ..	,,	2	2	259	140	183	5
,, 2427 ..	,,	4	2	190	105	134	3
,, 2431 ..	,,	4	2	209	125	111	2
Waterbuck 2378 ..	,,	2	1	?	?	53	2
Bushbuck 2328 ..	200—300	3	0	217	126	163	0
,, 2371 ..	,,	4	1	197	113	166	0
,, 2372 ..	,,	4	1	238	108	188	1
Reedbuck 2357 ..	,,	3	2	194	118	148	8
,, 2359 ..	,,	3	1	151	66	112	3
,, 2431 ..	,,	2	0	154	74	80	0
Waterbuck 2378 ..	,,	4	0	231	61	129	0
Bushbuck 2328 ..	300—342	3	0	112	93	105	0
,, 2371 ..	,,	1	0	73	49	51	0
,, 2372 ..	,,	1	1	64	48	59	2
Reedbuck 2357 ..	,,	2	0	216	119	142	0
,, 2359 ..	,,	1	0	33	29	30	0
Waterbuck 2378 ..	,,	1	0	62	15	20	0

The results of all experiments are shown in Table IV.

TABLE IV.—GIVING RESULTS OF EXPERIMENTS FROM ALL ANTELOPES.

Interval in days after infection of antelope	Number of experiments	Number of positive experiments	Number of flies dissected	Number of flies found infected	Percentage of infected flies
100—200	21	13	745	20	2·7
200—300	23	5	986	12	1·2
300—342	9	1	407	2	0·5
Totals ..	53	19	2138	34	1·5

It appears from the above table that as the interval after the infection of the antelope increases, the percentage of positive transmission experiments and of flies which become infected with flagellates after having fed on the buck diminishes. This diminution becomes still more striking when the results are compared with those recorded by the Commission of experiments carried out soon after the antelope were infected. (Of the twenty-four experiments carried out by the Commission seventeen were positive, 1,722 flies were dissected, and 6·9 per cent. were found to be infected.)

The results of injecting blood of these antelope into susceptible animals are shown in the following table :—

TABLE V.—GIVING RESULTS OF INJECTING THE BLOOD OF ANTELOPE INFECTED WITH *T. gambiense* INTO SUSCEPTIBLE ANIMALS.

Antelope	Number of days after infection of antelope	Animal used	Quantity of blood injected in c.c.	Result	Remarks
Reedbuck 2427 ..	200	Monkey	2	Inconclusive	Monkey died. Negative for 9 days.
Waterbuck 2378 ..	306	White rat	1	–	
,, ,, ..	316	Monkey	5	–	
,, ,, ..	316	White rat	1	–	
Bushbuck 2328 ..	355	,,	1½	–	
,, 2371 ..	330	,,	1	–	
,, 2372 ..	327	,,	1	+	Trypanosomes appeared in rat on the 12th day.
Reedbuck 2357 ..	345	,,	1	–	
,, 2359 ..	327	,,	1	–	
,, 2431 ..	320	,,	1	–	
Bushbuck 2372 ..	338	Monkey	5	Inconclusive	Monkey died before trypanosomes could have appeared.

It is seen that the injection of a small quantity of the blood of bushbuck 2372, three hundred and twenty-seven days after it had been infected with *T. gambiense*, produced an infection in a white rat. This, however, was the only positive result which was obtained. Three injections were carried out from waterbuck experiment 2378—on one occasion 5 c.c. of blood was injected—and all were negative. It will be remembered that the Commission found it easy to produce infections in susceptible animals by injecting the blood taken from these antelope soon after they were infected.

Can a Duiker be Infected with a Human Strain of T. gambiense?

Experiment 99, *Duiker*.—On August 30, 1910, 3 c.c. of this buck's blood were injected subcutaneously into a normal monkey to ascertain if the antelope naturally harboured trypanosomes. The monkey's blood was examined regularly for a month. No trypanosomes appeared in its blood, the monkey remaining healthy.

For nine days (January 25 to February 2, 1911, inclusive) laboratory-bred *G. palpalis* known to be infected with a human strain of *T. gambiense* were fed upon the buck.

On February 4, the tenth day after the infected flies first fed upon the antelope, *T. gambiense* appeared in fair numbers in its blood.

On February 10 and 11, 1911, 119 clean laboratory-bred *G. palpalis* were fed upon the duiker. These flies were subsequently fed on a normal monkey, which they infected after twenty-eight days had elapsed from the date of their first feed on the buck. Of forty-two flies which were dissected, two were found to be infected with flagellates.

Remarks.—The duiker was free from trypanosomes inoculable into a monkey on its arrival at the laboratory.

T. gambiense appeared in the buck's blood on the tenth day after infected flies had fed upon it, and clean laboratory-bred flies successfully transmitted the infection to a healthy susceptible monkey.

Conclusions.

(1) Antelope may remain in apparently perfect health for a year after having been infected with a human strain of *T. gambiense.*

(2) One antelope was still capable of infecting clean laboratory-bred *G. palpalis* 315 days after it had been infected.

(3) A small quantity of blood taken from one antelope 327 days after its infection was proved by inoculation into a white rat to be infective.

(4) As the interval after the infection of the antelope increases, their infectivity as tested by "cycle" transmission experiments, dissection of flies which have fed upon them, and by the injection of the buck's blood into susceptible animals, appears to diminish.

(5) A duiker was infected with a human strain of *T. gambiense* by feeding infected *G. palpalis* upon it.

OUR ARYAN BROTHER.

By Colonel R. H. FIRTH.
Royal Army Medical Corps.

Including administrative officers, there are 334 of our Corps serving constantly in India. It has often been a matter of speculation with me, as to how many of our officers who are serving in India, and how many of the hundreds of similar officers who have served in India, say, during the last thirty years, have formed any correct mental picture of the ideas and beliefs which are associated with and influence the daily lives of the many millions of our fellow subjects, to whom we refer as our Aryan brothers. So far as relates to this article, the term " Aryan brother " is confined to the masses of whom we speak casually as Hindus. That is to say, one excludes the purely Mohammedan races, who are of a non-Aryan origin and such others as profess some form of Christianity.

The difficulties in the way of men, like ourselves, who are mere birds of passage, in acquiring a working conception of what are the ethical ideas and religious beliefs of ordinary Aryans are enormous. True, there is a huge literature bearing on the subject, especially on those aspects which deal with the philosophic side of Hinduism; but few have either the time or inclination to read and study this literature. The result is that the average man serves in and finally leaves India, satisfied with the conception that our Aryan brother is nothing but an idolator, steeped in a mass of degraded superstition devoid at once of an historical basis, of reason, or any message and teaching of an ethical or moral nature. It has occurred to me that perhaps some who like to look deeper than the surface, might find it useful to read a simple and intelligible outline of Hindu ideas and practices, giving information of not only what is the nature of modern Hinduism, but also outlining the causes and modes of thought which have led to its evolution. In the following pages, one has attempted to trace the moral and religious development of our Ayran brother, down from the Vedic times, through the periods of hero-worship and Buddhism to the present day.

The Vedic Period.

Although the origin of the Aryans is unknown, it is conceded generally that the cradle of the race was in northern and western latitudes. They were a fair-skinned people, eating horse and ox

flesh, and drinking a fermented liquor known as *soma*, who invaded India some eighteen hundred years before Christ. At that time their religion was apparently a simple form of Nature worship. To them the sky was the Father and earth the Mother; they invoked Indra, the rain god, as a personal friend, and Agni, the fire god, as a protector from evil, while the sun and sunshine, as Surya, was the soul of all things. These Nature gods were not represented by idols. Their ritual was of the simplest, but embraced sacrifices on fire, oblations of the products of the earth, accompanied by prayers and hymns of praise. In their primitive state, the father of the family was priest and sacrificer, but even by the time the Aryans entered India their ritual had evidently become sufficiently complicated as to call for a class of priests. In these times there was clearly no idea of caste, but the priests and poets had evidently begun to concern themselves with speculations regarding the origin and end of all things. Naturally, certain individuals or families acquired repute in these matters, or as to success in sacrifice or prayer, and in knowledge of hymns and lore. From these simple beginnings, the priestly office among the Aryans tended to become more and more an hereditary position of power and responsibility.

The *purohitas* or priests soon acquired an important place in the Aryan social scheme, and though probably subordinate to the chiefs of the warrior class, there is evidence that often priest and warrior were combined. Among these men there gradually grew up a literature of sacred lore, chiefly in the form of hymns and poems, and the ability to remember accurately these hymns and to hand them down orally to others became a cult. It was during this period of dawning intellectuality that the great Vedic hymns were composed. These are word pictures of the traditions of the Aryans associated with times antecedent to their settlement in India. Concurrently, there was a slow compilation of a literature embodying the priestly traditions and ritual of sacrifice and worship. These have come down to this day and are the Brahmanas, an exclusive heritage of the present-day Brahmans or successors of the earlier Aryan *purohitas* or priests. To us, the Brahmanas and Vedic hymns are mainly interesting for the light they throw on modern Hindu ritual and the Aryan legends which they preserve regarding the origin of the world and the fourteen mythical progenitors of mankind, of whom Manu is the most quoted and familiar.

Apart from the Vedic hymns and Brahmanas, the evolution of Aryan thought and religion in these remote times led to the compilation of a third great work, namely, the Upanishads or

philosophical discussions as to the nature and means of realizing a knowledge of Brahma or the universal soul and cause of all things. As revealed in the Upanishads, the ethical and moral standpoint of the Aryan race is little different from the teaching as given in the Sermon on the Mount. The Vedic hymns and Brahmanas show a distinct tendency towards pantheism, but no evidence of the doctrines of metempsychosis and *Karma*, which are such a dominant feature of later Aryan thought. The Upanishads and Brahmanas are incorporated in the four Vedas.

The importance of preserving this religious literature and of securing purity of its interpretation undoubtedly emphasized the need of differentiation from among the people of a special class, the Brahmans or priests, and itself constitutes the germinal idea of the complicated system of caste, which for many centuries has been the characteristic of Hindus. But caste, as it is now understood, did not become a fixed institution until many centuries later. Wherever the Aryans went, conquered and settled down, their more intellectual and powerful elements, such as the warriors and priests, naturally claimed the first place in society, by virtue of caste, and for the maintenance of their own pretensions helped to build up or encourage the growth of a social system in which caste was the fundamental feature. Concurrent with this cause doubtless other different and subtle causes have been at work to favour the genesis and evolution of caste as we now know it. Nationality is one of these, as probably a number of present-day castes originated from distinct tribes or clans having their own customs and characteristics. Similarly, some castes are explicable as obvious aggregations of families having a common hereditary occupation, while others have arisen from sectarian or religious schisms.

The Romantic or Hero-worship Period.

Ethnological facts show that the Aryans in this invasion of India were not able to destroy or even displace the Dravidian and other races which formed the bulk of the population of the land. The result was that even at the period of which we now write, some 1000 B.C., the Aryans were not a united people, but composed of tribes and clans, not all of pure Aryan stock, and tainted with all manner of religious beliefs. This condition of affairs naturally affected the original purity of the real Aryan religion, and the most stringent laws were enacted to prevent the Vedas being corrupted. In spite of these efforts, there was a gradual permeation of outside

doctrines, with legends and stories of mythical heroes, into the simpler and purer cult of the early Aryan settlers in India. It is probable that to these influences and to these sources may be attributed the adoption and general acceptance by the Aryans of the two doctrines of metempsychosis and *Karma* which are so dominant throughout their later history. In these times, there were two great parties in the Aryan community; one headed by Vashishtha, of the old priestly class who represented the original orthodoxy, the other headed by a warrior chief named Viohwâmitra, who represented views and beliefs largely of non-Aryan origin. The outcome was a long series of wars and the leaders of the respective elements acquired in varying degree the worship of their adherents. It is as an account of these great wars that the epic poem known as the Mahâbhârata came into being. Like the Iliad and Odyssey of Homer this venerated epic was handed down by oral methods, then it was recorded in Sanskrit, but not translated into Hindi until as late as 1574 of our era. In this epic, the heroes on one side are the five Pandava princes who were assisted by Krishna. The heroes on the other side were the hundred Kuru princes, and known as the Kanravas. The end of this quarrel was the total annihilation of the Kanravas and the ultimate absorption of the Pandava survivors into Indra's abode of eternal peace. Around this story have accumulated, in the course of centuries, many legends, moral discourses and treatises, including the Bhagavat Gita or Hindu Bible of the present day. Practically, the Mahábhârata contains in poetic form a moral and religious code which is part and parcel of later Aryan practice and belief.

Later, another terrific struggle took place between rival factions, namely, the Kosalas of Oudh and the Kasis of the upper Gangetic valley. The heroes of the former were Rama and his wife Sita, also his half brother Lakshman. The doings and wanderings of these persons and their relations with Hanuman, the monkey god-king of the Nilgiris, are recorded in another epic, the Ramâyana. This poem differs from the Mahábhârata in that it is characterized by tender sentiments of domestic virtue and affection rather than by tales of bravery. Both these great epics were the product of this period, which may be described as the romantic period of Aryan evolution, and during which hero-worship and deification of mythical or real heroes acquired a definite footing among the Aryans. The general teaching of the earlier Vedic period was towards a pantheism, therefore in these times the Aryan mind found no difficulty in according divine honours to humans con-

sidered to have manifested in some way the nature of the Supreme Soul which they believed to be a part of every human being. At the present day, this mentality is evident among Aryans. A recognition of these facts explains the exalted position which the heroes of the epics hold in later developments of Aryan belief, and why the epics are even now the classic religion and moral literature of the modern Hindu.

The Buddhist or Ascetic Period.

We have seen the crystallization out of speculations, among the earlier Aryans, as to the future life in the evolution of a philosophy as formulated in the Upanishads; and the crystallization out of a more material religion in the forms of a quasi hero-worship, centring round the legends and tales incorporated in the great epic poems, the Mahâbhârata and the Ramâyana. As exponents of the spiritual and moral teaching associated with and to be derived from these books the priests or Brahmans generally maintained exclusive and autocratic powers, though the monopoly of leadership in religious thought was challenged spasmodically by the Kshatriyas or warrior class who were still at the head of Aryan society. Owing to the influence of ideas which probably had been derived from contact and intermingling with the Dravidian and other conquered tribes, the fundamental basis of the religious philosophy of the Aryans of this period was the doctrine of transmigration of souls and that human suffering was only to be destroyed by the termination of the cycle of re-births. The much desired termination of re-birth cycles was to be obtained only by penances, elaborate sacrifices and the saying of *mantras* or prayers. The two latter depended for their efficacy mainly on the influence of the Brahmans. The complication of the sacrificial rites became inconceivable, and the tyranny of these rites and penances such that a strong undercurrent of revolt against the orthodox teaching of the Brahmans set in. The chief exponents of this reaction were a numerous class of wandering devotees or mendicants, who though living an ascetic life performed no sacrifices and practised no penances. These were the undoubted forerunners of the *saddhus*, *byragis* and *fakirs* of the present day.

The somewhat nebulous views of these wandering ascetics, revolting against the extremes of spiritual discipline inculcated by the Brahmans, were definitely shaped by the appearance and teaching of Siddartha Gautama, son of a Sakya chief and born in the Nepal Terai in 580 B.C. Having abandoned all worldly com-

forts and delights, Gautama developed his spiritual nature to such an extent as to become or declare himself the Buddha or Enlightened One. As the Buddha, he settled about 557 B.C. at Sarnath near Benares, and founded there the settlement whose interesting remains have only within the last six years been excavated. Here he preached and disseminated by a rapidly increasing number of disciples the fundamental principle of his doctrine, which was a revolt against the tyrannical Brahmanical practices and superstitions of his time. While believing in the theory of transmigration of souls, the essence of Buddha's teaching was the uselessness of bodily penances, and the uselessness of priests or sacrifices as a means of escaping from the cycle of re-births, The means to this end lay in man's own heart, through the "eight-fold path" of right resolve, right views, right speech, right actions, right living, right effort, right self-knowledge and right meditation.

In spite of the revolutionary nature of his views, Buddha made many converts. While Buddhism cannot be said to have completely ousted the previous Brahmanical teaching throughout Aryan India, still for the next twelve hundred years it may be said to have been the dominant cult among the Aryan races. Contemporary with Buddha was Mahâvira, a well-born ascetic who founded the sect of Jains. This is the only monastic order of this period which has survived and carried its tenets and organization down to our own time. The Jains reverence twenty-four saints who have finished the cycles of human existence, and their founder is considered to be the twenty-fourth. Mahâvira held the same views as Buddha regarding the sacredness of life, but differed from him in accepting the orthodox view of self-mortification by penances. He believed also in the separate existence of the soul, which was denied by Buddha.

THE SHIVA-CULT PERIOD.

Although Buddhism was dominant among the Aryan races in India from the death of Buddha down to the end of the seventh century, that is, for nearly thirteen hundred years, it must be remembered that the orthodox Brahmanical cult, as existing before Buddha's time, had not died out completely. It still had its adherents as a small and relatively unimportant sect. Moreover, profound changes had come over even the Brahmanical religious practices and ideas as the result of Buddhism. The killing of animals as part of the sacrificial rites had nearly ceased, or was practised only by some low castes. Sacrifice had lost most of its

magical value and was regarded rather as of mere symbolic significance. The chief centre of the Brahmans and others who had resisted the teaching of Buddha would appear to have been Benares. In the course of the years which elapsed after Buddha's death, his philosophy and simple rule of life became modified and degenerated in the hands of successive exponents. Gradually superstitious errors were added to his simpler faith and he became to many Aryans but an incarnation of Vishnu, one of their hero-gods of the previous period. The result of this decadence was inevitable; a reaction set in, in the form of a revival of Brahmanical activity led by the Hindu reformer named Sankara. This occurred in the early part of the eighth century, and may be said to mark the beginning of the true Pantheistic period, and from this time may be said to commence the evolution of Hinduism as we meet with it in our day.

To understand the true meaning and nature of this Pantheistic movement it is necessary to appreciate the religious atmosphere when Sankara began his propaganda. Buddha had broken down the crude material religion which the earlier Aryan Brahmans had evolved for the masses or those too unintellectual to understand the higher philosophy and doctrines of the educated Brahmans. Buddhism had purified the national religion and afforded a common basis for all races and sects, but it had failed to provide any material object of worship and also left untouched the problem of the First Cause. Sankara attempted to, and did, provide a practical religious cult appealing to the senses of the masses, basing it upon the earlier Aryan legends with which most were familiar, and yet rendering it not inconsistent with the Vedic philosophy.

For a thousand years or more the Aryan mind had been embued with three main ideas: these were, a belief in metempsychosis; a belief in *Karma* or action, and a belief that the universe was originally the Soul only and that the origin of Creation proceeded from this Supreme Spirit, that is the Eternal Essence or Brahman. According to metempsychosis, death does not release man's soul permanently from matter, but that the soul may have to return again and again to this world animating other bodies, human, bestial, or vegetal. The doctrine of *Karma* implies that upon man's actions in this life depends the condition or state in which the soul will be re-incarnated. In plain language, the present state is the result of the past, and the future depends upon the present. These two ideas are simple enough, but it is when we come to analyse the Aryan theory of Creation that difficulties

begin. To appreciate, however, the inner meaning of ordinary Aryan ideas and beliefs it is necessary to understand the essential ideas running through the esoteric philosophy and doctrine of the Brahmanical Aryans.

According to this teaching the Creation was really a manifestation or passing into a conditioned state of the Brahman or Eternal Essence; that is, into a concept known as *Ishwara*, which is Self or Cause of all things. The subtlety of this idea is great, but is comparable to the passing of a man from a condition of deep sleep to dreaming and then waking. The essential spirit of Ishwara makes manifest *Prakriti*, which is the Essence of Matter originally inherent in Brahman, but only now manifested. By means of his divine power, called *sakti*, Ishwara causes Prakriti to take form. The forms of Prakriti thus evolved are the *Trimurti*, or three aspects of Ishwara. These are Brahma, representing the conditions of Creating; Vishnu, representing equilibrium or rhythm, and commonly described as the Preserver; and Shiva, representing dissolving power and commonly described as the Destroyer. Many of us are familiar with Indian drawings in which this drama of creation is represented by a figure, which is Ishwara, floating on the waters of chaos and reclining on a serpent, the symbol of Eternity, while Brahma, the creator, is depicted as springing from a lotus flower growing from the navel of Ishwara. The *Trimurti* are conceived to have three qualities or conditions. Thus Brahma represents the quality of Being, Vishnu represents the quality of Thinking, and Shiva represents the quality of Happiness. Further the *trimurti* have their *saktis*, or divine powers, which enable them to perform their functions in the universe. Among the masses or populace, these *saktis* are regarded as wives of the *Trimurti*, and, in this way, we find the *sakti* of Brahma deified as Saraswati or goddess of wisdom; the *sakti* of Vishnu is Lakshmi, or goddess of prosperity; and the *sakti* of Shiva is Kali or Durgâ, the terrible goddess of sacrifice, sickness and destruction.

The foregoing outline will give the reader an idea of the mental attitude of the Aryans and on which Sankara, in the eighth century, began to work. Sankara's teaching took the form practically of an exaggerated cult of Shiva. Conceived originally as a worship of Shiva as a god alone, the cult rapidly expanded or degenerated into a polytheism in which the wives of Shiva, that is Devi, Durgâ and Kali acquired exaggerated importance. This resulted in the evolution of numerous sects of saktas or worshippers of the female energy, using the *yoni* and *yantra* as accepted symbols, just

as the lingam or phallus was, and is, the symbol of Shiva. Sankara emphasized cremation of the dead, infant marriage and non-marriage of widows. Although there is little doubt that Sankara was a devout man and preached a relatively clean religion suitable for his times, yet, after his death, the excrescences which grew gradually upon his original cult of Shiva led to the development of the grossest depravities in the form of religion, especially under the evolution of the *sakta* sects. These degenerate cults were the dominant religions of the masses in India for some three hundred years after the death of Sankara.

The Vishnu-Krishna Period.

We find ourselves now at the beginning of the eleventh century, when the influence of the Mohammedan invaders was beginning to be felt throughout India. Some of the most famous and venerated shrines of Shiva had been destroyed, and the destruction of the gigantic lingam in the temple of Somnath, in Guzerat, made such an impression on the Aryan mind as to discredit seriously Shivaism and its auxiliary cults. In the gloom of these times the legends of glory and victorious deeds of Vishnu were revived from the earlier epics, and took the shape of the Vishnu puranas. The prophet of this new religion was Ramanuja, a Brahman of Southern India. In 1150, he commenced a campaign against Shivaism and substituted for veneration in place of the lingam the images of Vishnu, Krishna, and Rama. All these were personalities familiar by repute to his contemporaries as heroes in old legends and epics. With these male heroes were associated for veneration their respective wives, Lakshmi, Rukmini and Sita. Though Ramanuja's teaching was but the substitution of one set of incarnations of the Trimurti for another, its distinguishing feature was that he believed that the human soul was distinct from the Supreme Spirit, and retained its identity even after absorption into the Supreme Being. Like Sankara, he recognized cremation of the dead, infant marriages, and non-marriage of widows, while the merit of good works was insisted on as a means for obtaining final relief from re-births. His conflict with Shivaism was conducted with spirit and prospered for some hundred years. It received then a set-back by the appearance of Bassava, a Mahratta Brahman, who, claiming to be an incarnation of Shiva, denied the superiority of the Brahman caste, advocated abolition of all caste, opposed cremation and even questioned the inspired nature of the Vidas. Bassava's teaching

made little headway, though a mendicant order which he established survives even to this day.

The political outlook in India became gradually worse. Islam was advancing steadily and the danger to Hinduism still increased owing to the rivalry between the Shivaites and the Vishnuites. The breach was bridged by the appearance early in the thirteenth century of Madhava, a Kanarese Brahman, who preached vigorously the special worship of Krishna, but, unlike Ramanuja, without displaying hostility to Shivaism. He effected a union of Shivaites and Vishnuites under Krishna and permitted Shiva, Durgà, Kali, and Ganesh, one of the sons of Shiva, to be worshipped alongside of Vishnu, who was represented as Krishna and variously regarded as either Vishnu himself or his eighth incarnation. This cult of Krishna made rapid progress, as he was a familiar name to all as one of the heroes of the Mahâbhârata. Associated with the Krishna cult was the doctrine of the independence of the human soul and Supreme Spirit, coupled with the view that Vishnu or Krishna was the only supreme Eternal Being, all the other gods, like Shiva and Brahma, being subject to dissolution. The cult was subjected to some modification by Ramanand in the fourteenth century, who emphasized the importance of Rama as an incarnation of God in human form. This development is of interest as suggestive of the possible influence of the Christian idea, at this time becoming familiar to the Aryan races by contact with Roman Catholic missionaries. Practically, in this composite form, Krishna worship with tolerance for Shiva veneration dominated Aryan religious thought until the sixteenth century, when political conditions compelled the adoption of more elastic schools of moral and religious thought.

The Conciliatory or Synthetic Period.

Although the worship of Vishnu under the forms of Krishna and Rama had spread far and wide still, contemporaneously, the more primitive phallic cult of Shiva survived in places; in fact, although the Aryan race were paying homage impartially to both these two gods of the Triad and in certain districts invoking, with many degraded rites, the goddesses of the Sakta sects, yet a steady disintegration of Hindo-Aryanism was taking place under the influence of Mohammedan political power. The question naturally arose, how could Hindo-Aryanism be preserved? Three possible methods suggested themselves; these were: (1) To make the religion sufficiently alluring and voluptuous to attract a people no

longer confident in either their gods or their priesthood; or (2) to evolve a new national religion suitable to the newer ideas awakened by contact with Islam; or (3) to so modify the existing religion as to sufficiently resemble outwardly the Muslim faith as to avoid persecution and derision. Practical efforts on these lines found expression in the rise of corresponding sects in the fifteenth, sixteenth and seventeenth centuries.

The first group were those such as the Radha Vallabhis and the Chaitanites. These advocated Radha worship and taught that the best form of devotion was that which Radha, as the favourite mistress of Krishna, felt for him. Although these sects practised vegetarianism and total abstinence from intoxicants, forbade animal sacrifices and favoured the re-marriage of widows, their pronounced sensual idea caused them to make no general headway. Both these sects survive still in Bengal.

Of a different type were the second group of sects, or those founded by Kabir in Oudh and by Guru Nanak in the Punjab. Kabir was a non-Brahman monotheist, but did not deny the existence of other deities. His main idea was that worship of god or gods was not necessary; to him, purity of heart was all important, combined with implicit devotion to the *guru* or spiritual guide. Much of Kabir's teaching was acceptable to the Mohammedans of his day, among whom he obtained many converts. A few of his professed followers are still to be found in India now. It is doubtful whether Kabir made any great headway among the masses; still his teaching was the forerunner of that propounded by Nanak in the Punjab. Nanak, like Kabir, tried to assimilate his inherited Aryan prejudices and teaching with those of the dominant Muslim around him. He claimed that the Supreme Being was his *guru*, who had appointed him as the *guru* of mankind. He admitted all castes into his sect, which is now well known as the Sikhs of the Punjab. Nanak was succeeded by nine *gurus* and under the last of these the Sikhs developed into a powerful political organization, thus transforming Nanak's peaceful religion into a militant creed. Sikhism survives to this day, but it is affected largely by Hindu ideas and practices very different to Nanak's original teaching. Sikhism now is virtually a vague pantheism disguised as a monotheism.

The third group of conciliatory sects established in this period were the Rama worshipping sects of Rajputana which, though they made Rama their special god, allowed no idols to be made or venerated. In their form of worship and customs these sects have

a strong resemblance to Islamism. Two mendicant orders of this sect still exist in Rajputana.

The Modern Period.

This extends from the early part of the eighteenth century to the present time, and covers the period of Mohammedan decay and the rise with consolidation of British power in India. During this time, new and potent factors such as Western education and Christianity, have come into play. The result has been the gradual disintegration of some old beliefs and the formation of new ones. But, concurrent with this destructive and constructive process, there has been a survival and, thanks to stability of Government combined with a policy of religious freedom, an actual revival of most of the religious types of the post-Buddhist period.

At the present time, Aryan religious and ethical thought falls into three main groups. These are: (1) The speculative philosophy of the educated and spiritually minded Brahmans; (2) the pantheistic conceptions of the masses and uneducated, which may be termed modern Hinduism; and (3) the Neo-Hinduism or Theism of the educated and travelled Aryans.

The first does not permit of extended analysis here. To some extent its fundamental ideas have been explained. Its dominant tenets are, unity of the human soul with the Supreme Soul, a belief in re-births and in *Karma*, but behind it all is the view that the world, as revealed by the senses, is but an illusion, and that consequently, the real world, or true knowledge, can only be reached by suppressing or getting behind the senses. This can only be done by processes of introspective contemplation. In its simple form, this philosophy is clear, but it is associated with pantheism and veneration of material gods and goddesses, the earthly representations of various manifestations of the super-physical god or Supreme Soul. Of the various shrines or temples of the gods and goddesses of this pantheon, the Brahmans are the exclusive guardians and ministrants.

The Brahmanical religious philosophy of this day is far removed from the simple nature worship of their Aryan forbears. What is the precise ritual associated with the higher philosophy of the Brahmans is more or less a sealed book to those outside their exclusive caste, but we can gain some idea of its nature by observing the actions of a *Saddhu* or other religious devotee. After performing ordinary ablutions, the sun will be saluted by casting water towards it, or by the pouring out of water from various

vessels. Then freedom of the body from pollution of sins will be sought by pouring water over the head. Next, the sacred thread is changed from the right shoulder to the left, and more water poured over the extended fingers. Then the thread is placed on the neck and more water poured between the thumb and forefinger. These are rites addressed to the gods and sages or saints of the past. Then follows a counting of beads on a rosary of rudra berries accompanied by the repeating of *mantras* or prayers. Then follow the curious *pranayama* or exercise of breathing. The nostrils are compressed alternately and breath expelled and inhaled through the other, finally both nostrils are closed and the breath held as long as possible. After this, symbolic signs are made with the fingers and thumb to represent the ten incarnations of Vishnu. Accompanying these manual acts is a repetition of other *mantras* with numerous invocations to the Supreme Being in his endless manifestations; all these are preceded by utterance of the mystic syllable Ōm or Aum, which means at once the Aryan Trinity of Brahma, Vishnu and Shiva, or the three worlds of Heaven, Air and Earth. This *sandhya*, or form of worship, is observed at least three times a day; it is regarded as a spiritual exercise to free the human soul from earthly pollution and as a means to place it in direct relation with the superphysical world and so prepare it for the final goal of all Aryan ritual, namely, meditation and contemplation. For efficacy, every rite must be performed with exactitude and order as laid down in the sacred books and prescribed by their spiritual advisers or *gurus*. Prepared and fortified in this way, the Brahman can and does spend hours absorbed in motionless meditation on the Supreme Soul—the Brahma—the only Reality. Apart from these meditation exercises, every Brahman worships at the shrine or temple of some god which represents one or other incarnation of either Vishnu or Shiva, whom he regards as the material representation of the super-physical Supreme Soul or Brahma.

The foregoing is not the form which the religious worship of the masses takes. Theirs is really a material pantheism, evolved by the Brahmans, and based on the mythical personages of the early legends of the Aryan people. But associated with this pantheism is a subtle thread of thought which links it to the esoteric philosophy of the Brahmans. The greater number of the people go through some form of *sandhya* on the lines of the Brahmans, but of a much simpler nature, in most cases amounting to but a repetition of some *mantra* or mystic formula laid down for them by their local Brahman. But such *sandhya* or religious worship is with them

a spiritual exercise associated always with some material god or goddess, whom they are taught to believe, and do believe to be local manifestations of the impersonal and super-physical Supreme Being.

The present day Aryan or Hindu belongs to one or other of the following religious sects: (1) Vaishnavas or worshippers of Vishnu. These can be recognized usually by their caste mark taking the form of three vertical lines. The Vaishnavas are most numerous in the North and North-West of India. They are divisible into two main subsects, namely, (*a*) those who worship Vishnu in his incarnation as Rama with his wife Sita, and (*b*) those who worship him as Krishna with his wives Lakshmi and Rukmini, and his favourite mistress Radha.

(2) Saivas or worshippers of Shiva. These are numerous in Benares, in Bengal and some parts of Southern India. The caste mark is usually three horizontal lines.

(3) Saktas or worshippers of the female energy, especially as the goddesses Kali, Devi and Durgâ, all wives of Shiva. This cult is paramount in Bengal.

It is noticeable that there is no sect having Brahma as its titular head. The reason of this is that this member of the *Trimurti* is supposed to have completed his work in this world.

Although the above represents the broad divisions into which the religious ideas of the Aryan masses divide themselves, it must be understood that there are many subdivisions, based on veneration of the various *sakti* or functions and powers of the central god or goddess. This explains the multiplicity of deities in the Aryan or modern Hindu pantheon. While some sects represent a more or less wholesome and clean religious outlook, there are many, particularly subsects of the Saktas, which are examples of most depraved and sensual practices under the mantle of religion. It is true they are relatively few, but they exist more especially in Bengal.

Associated with the two main sects among modern Aryans are a number of ascetic sects or mendicant orders. These constitute the bulk of the wandering *saddhus* and *byragis* of India. Among the Saivas, we find Sunyasis, Dandis, Paramanhas and Brahmacharis, all followers of Sankara, referred to in the Shiva cult period. There are also Lingaites or followers of Bassava, who appeared somewhat later at the end of the twelfth century. Similarly, among the Vaishnavas are followers of Ramanuja, Madhava, Ramanand, Kabir, Ballava and Chaitan. All these sect leaders or

quasi-reformers have been mentioned in the preceding historical outline. Among the Sikhs or followers of Nanak are three ascetic orders, the Udasis, the Nirmalis and the Nihangs. All the ascetic sects have their distinguishing views and customs. Though in several instances their *raison d'être* is based on an opposition to the Brahmans, these mendicant devotees constitute some of the most potent links in the wonderful chain which, even now, appears to bind the Hindo-Aryans together and which, too, has enabled some of their primal beliefs to survive in a form which apparently had disappeared.

Coming back to the practical religion of the Aryan masses, we find that they recognize three different aspects of worship. First, each village or commune has its patron deity. Images or symbols of them are found everywhere. Next, there is the household god or that deity which is regarded by each family as its special protector. Then, there is the personal god whom the *guru* or spiritual adviser appoints to each individual as his or her patron deity. All these take the name or form of one or other of the many manifestations, or incarnations, or attributes associated with the central god in which they believe, that is either Vishnu or Shiva. There is no limit to the attentions which a devout Aryan will pay to his idol or symbol of his household or personal deity. In response to these attentions the patron deity is expected to bestow corresponding favours. The ordinary person who has not the means or time for regular household worship hires a Brahman occasionally to recite the necessary and suitable *mantras;* this vicarious service is supplemented by occasional visits to the temple on festival days, accompanied, of course, by suitable offerings at the shrine. The expenses associated with an active observance of his religion by the ordinary Aryan, outside the Brahman caste, are often heavy. This is particularly so in respect of observances for the dead. According to the Aryan doctrine of the future life, souls of the dead follow one of two paths according to their *Karma.* Thus, souls of saints who have fulfilled their *Karma* travel through the rays of the sun, and never return to this earth. Ordinary souls who have not finished their cycle of re-births will always remain tied to this earth unless certain *shradha* ceremonies are duly performed to help them on their way to Yama or the state of Bliss. The belief in the efficacy of these *shradha* ceremonies, which extend over twelve months up to three years, is a constant source of reckless expenditure.

There remains for brief review the ethical and religious tenets

of the educated and most westernized Aryans. These tenets may be described as a Neo-Hinduism or Theism. It is true they are held by a numerically small number of present-day Aryans, but it is not unlikely that the movement which they express may influence profoundly in years to come the further evolution of moral and religious codes among the whole Aryan race. This movement dates from about 1825, when a high-caste Brahman, named Ram Mohun Roy, started what he called the Brahmo Somaj. This was really nothing but an unorthodox Hindu sect advocating a monotheism based upon the Upanishads, but strongly tainted, as regards its ethics, by ideas derived from Muslim and Christian literature. The Somaj made little headway during its founder's lifetime. In 1843, it was resuscitated by Debendra Nath Tagore, who, as the result of an inquiry into the nature of the doctrines of the Vedas, forced the sect to an open rupture with orthodox Hinduism, on the ground that a pure Theism could not be based upon the Vedic literature. The Brahmo Somaj now fell back upon what they called Natural Religion, having no written scriptures, but basing their doctrines on the laws of Nature and the primitive convictions implanted in the mind of man. Unfortunately, many members, though outwardly professing this simple faith and abhorrence of idolatry, differed in their domestic life little from their orthodox idolatrous countrymen. As the facts became known, a schism in in the society was unavoidable. The more conservative members formed a sect of their own known as the Adi Brahmo Somaj, while the more advanced thinkers styled themselves the Brahmo Somaj. The Adi (original) Brahmo Somaj remained under the guidance of Debendra Nath Tagore till his death, but the society at this present time numbers barely five hundred members. The leader of the progressive party was Babu Keshub Chunder Sen, and under his energetic guidance the Brahmo Somaj increased rapidly both in numbers and influence. Under him, the Society adopted new principles of thought and action, and became nothing more than advanced Unitarianism, using impartially all that was best from the writings of the Vedas, the Quran and the Bible. Later Chunder Sen attempted to lead the Somaj through the devious ways of his own inherited Aryan mysticism into pure asceticism, with a strong leaning towards the adoration of *sakti* or female energy. A further schism in the Brahmo Somaj resulted owing to the revolt of a party of uncompromising theists under the lead of Pundit Sevanath Sastri, who in 1878 established the Sadharan (universal) Brahmo Somaj. The creed of this body of non-Hindu Theists, which is

now in an active state of existence, amounts practically to the following: Belief in the necessity and duty of spiritual worship of God; a total disbelief in any infallible book or man, as the means to salvation; belief in an immortal and infinite Creator, and a belief in the immortality of the soul. This Somaj is definitely opposed to both caste and idolatry. As a purely theistic sect, the Sadharan Brahmo Somaj is in touch with Unitarian bodies in both America and Europe. The activity of this sect is chiefly in Kathiawar and Western India. Its freedom of thought is wider than that of the Brahmo Somaj of Bengal.

After the death of Keshub Chunder Sen, the Brahmo Somaj fell under the dominant influence of Babu Majoomder, who, freeing it from some of the later developments of Keshub's time, has worked it up into a large and flourishing sect, mainly in Bengal. The present day tenets of the Brahmo Somaj are a belief in one Supreme Deity, the non-inspired nature of the Vedas, the acceptance of such portions of the Bible and Quran as bear up and support a simple code of right living, a belief in the transmigration of souls, no recognition of caste or idolatry in any form, the forbidding of child marriage and recognition of widow marriage. If we except the doctrine of metempsychosis, the tenets of the Brahmo Somaj of Bengal differ little from those of the Sadharan Brahmo Somaj of Kathiawar.

Concurrent with the evolution of the various phases of the Brahmo Somaj, there has arisen another sect of Aryan Theists. These are the Arya Somaj, a body who follow the teaching of Dayananda Saraovati, who died in 1883. The Aryan Somaj is mostly to be met with in the Punjab and United Provinces. It is an unorthodox Hindu Sect, differing only in its views from the Brahmo Somaj in the fact that it derives its inspiration from, and attaches weight and veneration to the Vedas. Its views as to caste are less liberal than the Brahmo Somaj, but to all intents and purposes their range of view is the same; except that the Arya is Hindu in theory, while the Brahmo is non-Hindu. The Arya Somaj is opposed to idolatry and child marriage, favours a modified caste system and the re-marriage of widows. Like the Brahmo, the Arya Somaj believes in the immortality but independence of the human soul.

Summary.

The foregoing historical survey gives in outline the evolution of moral, ethical and religious thought among our Aryan brothers from some two thousand years before Christ to our own times.

To the superficial thinker it will seem merely kaleidoscopic. It is true there have been many changes, but, for all that, we find that there has been a marvellous continuity of thought and ideas through the last three thousand years. We find our Aryan brother still imbued with the fundamental ideas of metempsychosis and *Karma*. We find the greater number of our present day fellow Aryans to be pantheists, that is worshippers of one or more incarnations or manifestations of functions of either Vishnu or Shiva, who themselves were, as heroes in the mythical origin of the race, but incarnations of the super-physical Being into whom all wish and look for ultimate absorption. Even the very forms of popular pantheism are but survivals of cults in general acceptance throughout the land in the times which immediately followed the collapse of Buddhism. Over this apparently shoreless sea of chaotic superstition and often gross licence, which is practically the religion of the Aryan masses, is a veil of subtle and fascinating philosophy; while floating in it are undoubted elements of fine and noble sentiment. Though the gulf is wide which separates us and our beliefs from our Aryan brother and his beliefs, yet there is sufficient evidence in his ideas and practices to show that both he and we are merely striving to reach a common goal. It is the realization of this pathetic fact that should make us sympathetic rather than scornful and hypercritical of the particular path which he has chosen.

That the Aryan has chosen or drifted into this path is not that he is not a religious man, for no one who knows the people of India can doubt for a moment that they are essentially a religious people. That their ethical, moral and religious outlook should have taken the form it has is to be explained largely by their history and the physico-geographical conditions under which they live. For centuries they have been the prey of wars and pestilence, while for ages dense forest and swamp covered a considerable portion of their land. A study of the psychology of the Aryan races reveals to us that, combined with intellectual qualities of the highest order, they possess in an exaggerated degree imaginativeness, emotionalism, credulity and religious fervour. The combined influence of the political, physical and social conditions, aided by the intellectual and moral peculiarities of the people, has favoured and conduced to mental depression and gloomy religious speculations, leading naturally to mysticism, self-abnegation and the evolution among them of an ethical, moral and religious code at once full of far-fetched superstitions and asceticism.

What is the outlook for the future? It is impossible to be dogmatic. If one may venture to express views at all, one may say that whatever may be the modifications produced on our Aryan brother in ways of thought, sentiment, or customs by contact with the West, still his inherited tendencies are too strong, and his inherited beliefs too subtle and deep-rooted to allow him to break away in any notable degree from his immemorial past. Ethical, moral and religious evolution among the vast Aryan masses will probably still follow the old lines of pantheism and an ascetic philosophy. The modern Theism of the Sadharan Brahmo Somaj, of the Brahmo Somaj of Keshub Chunder Sen, and of the Arya Somaj appears to have a future. The first two are both non-Hindu, while the latter is definitely Hindu in sentiment. The latter is nothing but a liberal orthodoxy; the question is, Will prolonged contact with Western scholarship not extinguish it? Such a danger and contingency is less obvious with regard to the Brahmo Somaj. Through these sects, that is the Brahmo Somaj and the Arya Somaj, alone lies any real hope of a reformed Aryan faith; but, to be national and successful, they must be allowed to evolve on purely Aryan lines, and be unfinanced by Western enthusiasts.

THE PAPATACI FLIES (*PHLEBOTOMUS*) OF THE MALTESE ISLANDS.[1]

By R. NEWSTEAD, M.Sc., A.L.S., &c.

(*Continued from p.* 625.)

SYNONYMY, AFFINITIES, AND MORPHOLOGY OF THE GENUS PHLEBOTOMUS.

Though the differential characters of this genus have been given by several authors, and Grassi [3] has published an elaborate memoir on the morphology and biology of *Phlebotomus papatasii*, I consider that this report would be incomplete without giving some details concerning the morphology of these insects; all the more so because Grassi's paper, in Italian, is now very difficult to obtain and is also a very costly publication, in fact the price (£1 10s.) for so small a work is practically prohibitive, and certainly not within the reach of students in general.

I do not claim, however, to treat of this phase of the subject in an exhaustive way, but rather to point out the salient characters of these insects in a measure that may be helpful both to the medical profession and to the zoologist.

The genus *Phlebotomus* was established by Rondani in 1840, though the species for which it was founded had been placed by various authorities in other genera, such as *Bibio* (Scopoli, 1786), *Musca* (Gmelin, 1788-1793), *Ciniphes* (Costo, 1840). But as Rondani's name is now generally accepted, one need not go into further details regarding the nomenclature and synonyms of *Phlebotomus*. The taxonomic position of this genus is with the family Psychodidæ, and it is included in the sub-family Phlebotominæ. All the members of this family are small nemocerous insects, characterized by the possession of relatively large wings, which are clothed with either scales or hairs; and one of the most familiar representatives, and one also which is widely distributed and nearly related to *Phlebotomus*, is the genus *Psychoda* (sub-family Psychodinæ), the members of which are generally known to Englishmen as "moth-flies" or owl-midges." The short diagnosis which follows will serve at once to distinguish *Phlebotomus* from any of the allied genera in the Phlebotominæ, and also from the midges belonging to the Psychodinæ.

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Genus Phlebotomus, Rondani.

Mouth formed for piercing and sucking; palpi of five segments; antennæ long, filiform, and composed normally of sixteen segments; wings hairy, narrow, second longitudinal vein twice forked, cross-veins placed near the basal fourth of the wing; body clothed with hairs; sexual dimorphism distinct.

The larva (Pl. I, figs. 7, 8) is characterized by its caterpillar-like form (eruciform); by the presence of two pairs of long caudal bristles, which may equal the length of the body, and by the absence of true legs.

The pupa (Pl. I, fig. 12) is obtectate, and may be recognized by the presence of the larval skin, which invariably remains attached to the last two segments of the abdomen. It should be borne in mind, however, that the partial retention of the larval skin by the pupa is not peculiar to the genus *Phlebotomus*, as Speiser [8] has shown that the larval skin of *Helea* (*Forcipomyia*) *regulus*, Winn., one of the members of the Chironomidæ, also remains attached to the anal segments of the pupa. The larva of this genus does not, however, possess the long caudal bristles which are so characteristic of *Phlebotomus*, though in other ways it is not unlike the latter.

External Morphology.

Head (fig. 1) somewhat elongated, but distinctly narrowed at the nape, vertex clothed with long hairs; clypeus large and also clothed with hairs on the upper surface. Eyes large and intensely black.

Antennæ (fig. 2) very long and slender, and in all of the Maltese species consisting of sixteen segments; the first and second segments forming the scape are short and stout, the second one being somewhat spheroid in shape; the third is much the longest and of uniform width throughout; the remaining segments are gradually swollen proximally, especially the terminal ones; all are clothed with hairs; those arising from the swollen portions being much the longest, and considerably longer than the individual segment to which they are attached. In all of the Maltese species there are also present on several of the segments, and in both sexes, *a pair of relatively large geniculated spines* (fig. 2). These curious appendages are rendered practically invisible when the segment to which they are attached is mounted so that a dorso-ventral aspect is presented under the lens of the microscope; and for this reason apparently they have been hitherto overlooked by all the students

of this genus of insects. It is true that Grassi [3] has noted that "here and there one can observe a short hair curved and relatively thick"; but that he failed to recognize the true character and arrangement of these spines is perfectly clear. Now that they have been discovered it is highly probable that they will be found to exist in the majority of species, if not in all, and may, I think, be considered of generic importance. Annandale, in his description of the genus *Brunettia*, a new Psychodid discovered in Southern India, refers to a similar character, but in this instance the paired spines are somewhat **S**-shaped, and relatively much stouter than the corresponding spines in *Phlebotomus*. In the light of these discoveries, therefore, it is possible that similar spines may be discovered in various other members of the same family, though it is highly improbable that such structures will eventually be found to exist in all of them.

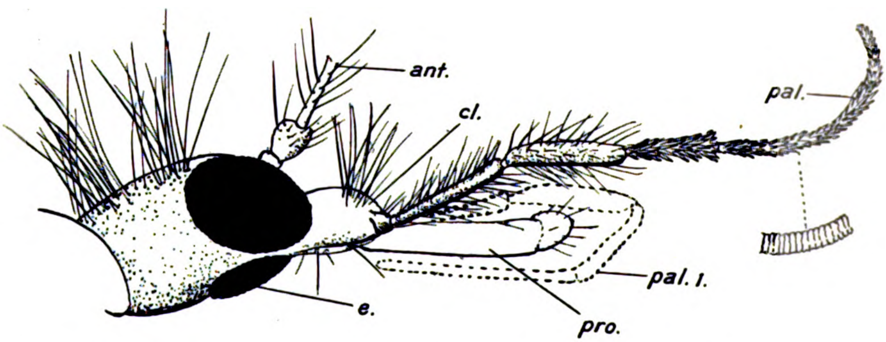

FIG. 1.—Head of *Phlebotomus papatasii*; *ant.*, antenna; *e*, eye; *cl.*, clypeus; *pal.* 1, palpus; *pro.*, proboscis.

Palpi (fig. 1).—These organs are generally said to be composed of four segments, but there are undoubtedly five, and this number may, I think, be considered common to all the members of this genus. Annandale [1] has pointed out that "a minute basal joint can sometimes be distinguished in fresh specimens," but that it is "often difficult to see, and appears to be imperfectly separated from the others." That the small basal segment is clearly articulated to the second there can be no doubt, as it can be seen quite distinctly when mounted so that it is not obscured by the surrounding structures. All of the segments are clothed (in *P. papatasii* at least) with variously formed scales, intermixed with a few hairs. The scales on the first three seg-

ments are for the most part very long and somewhat hair-like, those on the remaining segments short and closely packed together. The fourth and fifth segments, especially the latter, are distinctly

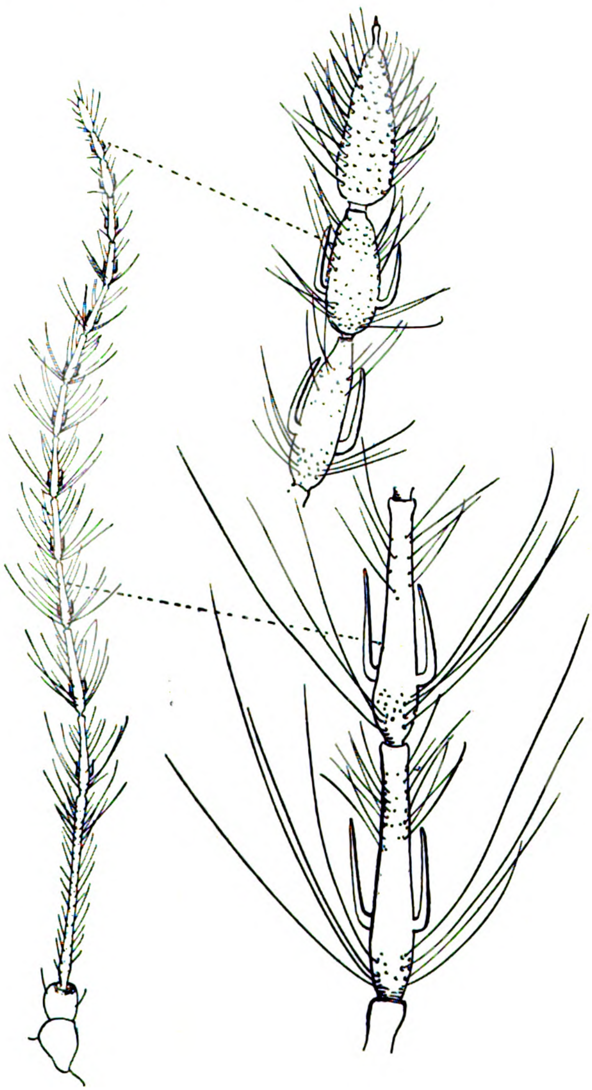

FIG. 2.—Antenna of *Phlebotomus papatasii*.

but somewhat irregularly annulated or ringed, a character which has also been hitherto overlooked by former investigators. In life, when these organs are at rest they are bent downwards and

backwards at the articulation of the third and fourth segments, so that the anterior half of the palpus is folded back more or less upon the proximal half; by this curious arrangement practically the whole of the proboscis is covered or protected (fig. 1, *pal.* 1).

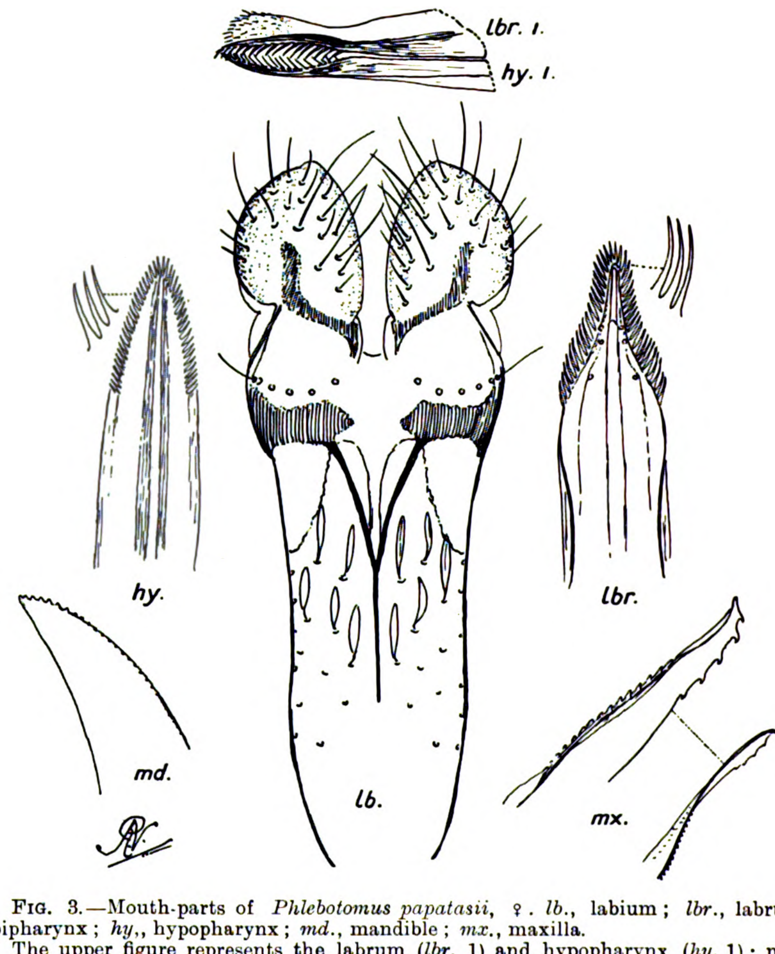

FIG. 3.—Mouth-parts of *Phlebotomus papatasii*, ♀. *lb.*, labium; *lbr.*, labrum-epipharynx; *hy,*, hypopharynx; *md.*, mandible; *mx.*, maxilla.
The upper figure represents the labrum (*lbr.* 1) and hypopharynx (*hy.* 1); male, *P. papatasii*, as seen in profile.

Proboscis (fig. 1).—Slightly shorter than the head, inclusive of the clypeus; in form it is somewhat cylindrical and slightly recurved distally. In the female it is composed of the following parts: *The labium* (fig. 3, *lb.*). This is much the largest organ, and, as far as one can judge, by viewing it in optical section,

it almost completely embraces the labrum-epipharynx; the proximal half is sparsely clothed with lanceolate scales, and the first third is markedly narrower than the rest; immediately in front of the dark chitinous apodeme or sclerite is a curved row of long, fine hairs; the labella are scarcely broader than the widest portion in the region of the apodeme, and are clothed with a number of fine and rather long hairs. *The labrum-epipharynx* (fig. 3, *lbr.*) is relatively narrow and the sides are parallel, but the apex is suddenly attenuated, the tip bluntly pointed, and the margins furnished with a series of long spinose teeth set closely together and numbering about twenty on either side; ventrally it is deeply and broadly channelled, but does not appear to possess interlocking teeth or other structures. *The hypopharynx* (fig. 3, *hy.*) is similar in width and general form to the labrum, but tapers off much more gradually towards the end, and the marginal spinose teeth are much shorter and placed so closely together as to present a finely serrated edge; its upper surface is distinctly and broadly concave or tough-like, and the salivary duct, which is small, occupies a central position. *The mandibles* (fig. 3, *md.*) are broad and blade-like, and have the outer edges faintly serrated, the serrations being rather widely separated. When at rest they lie, apparently, superimposed one over the other. *The maxillæ* (fig. 3, *mx.*) are much narrower than the mandibles, curved transversely, and attached to a broad, tough-shaped sclerite, not to a long, slender stalk as Grassi has shown. One edge is provided with five relatively large and widely separated teeth; the opposite edge with smaller ones set closely together.

Thorax (fig. 8).—This consists largely of the meso-thoracic division, the prothorax being represented by a very short extension which can be seen more or less distinctly in examples which have been macerated and mounted in Canada balsam. The scutellum and post-scutellum are well developed and conspicuous in mounted preparations.

Abdomen.—This is composed of ten segments, the last being modified by the external genitalia. In the female the appendages are simple, flattened, leaf-like structures, densely clothed with hairs and arranged in two pairs (figs. 8, 10). In the Maltese species they are all so similar in structure as to afford no diagnostic characters of importance. Annandale [1] states that these organs "become distorted and shrivelled in dried specimens." These structures can, however, be restored by maceration in caustic potash, but the best results may be obtained by preserving the specimens in alcohol.

External Genitalia of the Males.—These are large and complex structures (figs. 14 to 18), and afford a ready means of determining the sexes; moreover, their morphological characters are of great importance, as they present very marked specific differences whereby the closely allied species may be readily distinguished. These appendages are arranged in five pairs as follows: *Superior claspers* (*sc.* in all the figures). These are placed dorsally, and are larger than any of the other structures; they are composed of two distinct segments, of which the terminal or distal one is the smaller, and is provided at the apex with large spines, which in some species are curiously modified. They are generally densely hairy and large scales may also be present; but both hairs and scales are easily deciduous, and the greater portion of them usually fall away during the process of mounting for microscopical study. The accompanying illustrations must, therefore, be considered as representing these structures in a partly denuded condition. *Inferior claspers* (*ic.*). These are unisegmented and much shorter than the superior pair; they are ventrally placed, and may or may not have modified spines at the distal extremity. *Submedian lamellæ.* These lie between the inferior claspers, and although they are usually short, thin, leaf-like structures, in some instances (*P. minutus*) they are very similar to the clasper both in form and length. *Intermediate appendages* (*ia.*). These occupy a median position, and are often curiously modified; they form a branch of the superior clasper and are sometimes bi-lobed. *Intromittent organ* (*io.*). This is homologous with the "juxta" in *Glossina*, and is described as the penis by Grassi. It consists of a pair of long, slender and highly chitinized organs, which lie between the intermediate appendages. These completely ensheath the two long filamentous processes which form a continuation of the ejaculatory duct leading from the penultimate segment of the abdomen. In *P. papatasii* they have not been seen to extend beyond the intromittent organ or penis, while in *P. perniciosus* (figs. 16, 17), though lying apparently in a normal resting position, they project beyond it to a distance equalling one-half the length of the sheath.

Wing.—This is densely hairy, and may at once be distinguished from that of the mosquitoes (Culicidæ) by the entire absence of scales, the double fork of the second longitudinal vein, and the proximal position of the cross-veins. The hairy character is well shown in the illustrations (Pl. II, fig. 2, and Pl. III, figs. 1, 2), and when denuded (figs. 4 to 7) the venation can be seen with little difficulty in properly prepared specimens. The costa is the

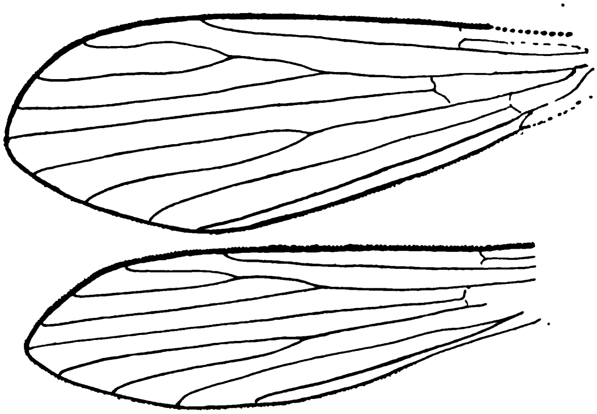

FIG. 4.—Wing-venation of *Phlebotomus papatasii*; upper, ♀ ; lower, ♂.

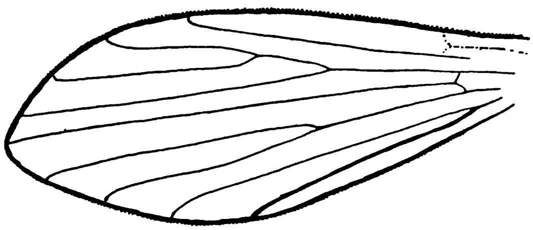

FIG. 5.—Wing-venation of *Phlebotomus nigerrimus*.

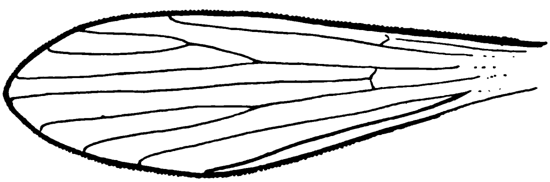

FIG. 6.—Wing-venation of *Phlebotomus perniciosus*.

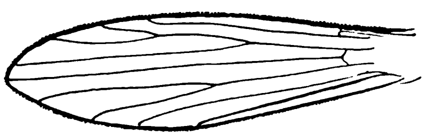

FIG. 7.—Wing-venation of *Phlebotomus minutus*.

thickest of the veins. The sub-costa, in comparison with that of the CULICIDÆ, is very short, curves downward distally, and joins the first longitudinal vein at or about one-fourth of the distance between the base and tip of the wing. The first longitudinal is simple, and unites with the costa about one-third from the tip; the second longitudinal is twice forked, and extends almost to the base of the wing; the third longitudinal is simple, and originates from the mid cross-vein; the fourth has origin at the base of the wing and is forked near the middle; the fifth and sixth are simple and united basally, the former curving upwards and uniting with the fourth considerably in advance of the base of the wing. The first cross-vein unites the costa with the sub-costa at a point immediately opposite to the turned-down portion of the latter, so that in effect they produce two cross-veins: the first extending from the first longitudinal vein to the sub-costa, the second from the tip of the latter to the costa. The mid cross-vein arises from the base of the third longitudinal and passes obliquely to the fourth; while the supernumerary vein is placed immediately above it, and passes obliquely to the second longitudinal.

Legs.—These are very long and slender and densely clothed with scales, the majority of which are flat, and closely resemble those which are found in the CULICIDÆ. The ungues are simple in all of the Maltese species, and do not offer any differential morphological characters.

Internal Morphology.

The Alimentary Canal (fig. 8).

This structure differs from that of the mosquito in having a true sucking stomach, and also in the possession of four Malpighian tubules instead of five. The general form and relative position of these organs in the female are as follows:—

The buccal cavity lies at the base of the clypeus; it is dilated distally, but almost immediately contracts and forms a slender tube which leads to the pharynx.

The œsophagus divides at a point a little in advance of the posterior margin of the head (nape), one tube leading to the sucking stomach, or food-reservoir, the other to the digestive canal.

The Sucking Stomach.—This is a large, thin-walled pouch, connected with the end of the œsophagus by means of a very slender tube. It lies on the left side of the digestive canal, and extends distally as far as the region of the fourth abdominal segment.

The Mid-gut or Chyle Stomach.—This is capable of great distension, and when filled with fresh blood occupies a large portion of the abdominal cavity; but when such food has been partly

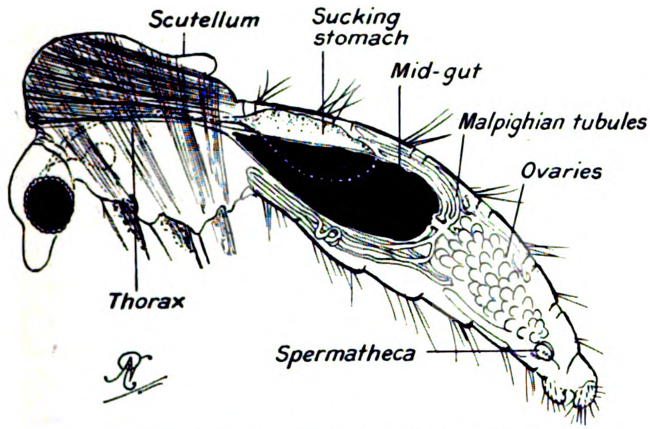

Fig. 8.—Internal morphology of *Phlebotomus*.

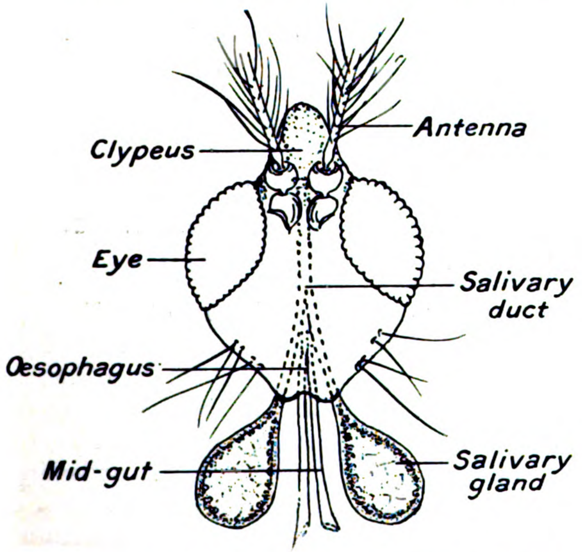

Fig. 9.—Head of *Phlebotomus*, showing position of salivary glands.

comminuted it becomes much smaller, and can be easily seen as a black, elongated pouch in the anterior portion of the body.

Malpighian Tubules.—There are two pairs of urinary organs, each pair being united at their bases, where they form a single tube,

which is connected with the intestine immediately below the mid-gut. They are of great length, extending forwards as far as the first abdominal segment, where they are folded and doubled backwards upon themselves, and also form loops in the mid-region of the ventral portion of the abdominal cavity.

The Salivary Glands (fig. 9).—These consist of two broadly dilated or lobe-like acinous glands, lying one upon either side of the prothorax. The periphery of these glands presents an even or smooth surface, and immediately within the exterior wall is a series of rather large secretory cells. The ducts leading from the acini unite near the mid-region of the head, forming a common duct, which enters the buccal cavity close to the base of the clypeus.

FIG. 10.—A female *Phlebotomus*, showing fully matured ovaries.

The Sexual Organs of the Female.

The ovaries occupy a variable position in the different stages of their development. In the early adult stages of the insect (fig. 8) they are very small, and are seen to extend from just behind the origin of the Malpighian tubules to the region of the penultimate segment of the abdomen. When fully matured (fig. 10) they occupy practically the whole of the abdominal cavity, extending forwards as far as the second segment. They are bi-lateral, and each ovary comprises 20 to 25 ova, representing a full complement of 40 to 50, so that these insects cannot be considered very prolific. The tubular oviducts unite at a point just before reaching the base of the inferior claspers, where they form the common oviduct.

The spermathecæ (fig. 11) lie in the median line in the region of the oviducts. They consist of a single, thin-walled, sub-spherical sac, and are relatively very large; at their junction with the duct

they are strongly chitinized, and consist of usually ten transverse and convex ridges, which are so constricted at the margins as to present, in optical section, a distinct and well-marked crenulation. The tubular ducts, which are long and straight, open into the oviduct near to its termination, apparently.

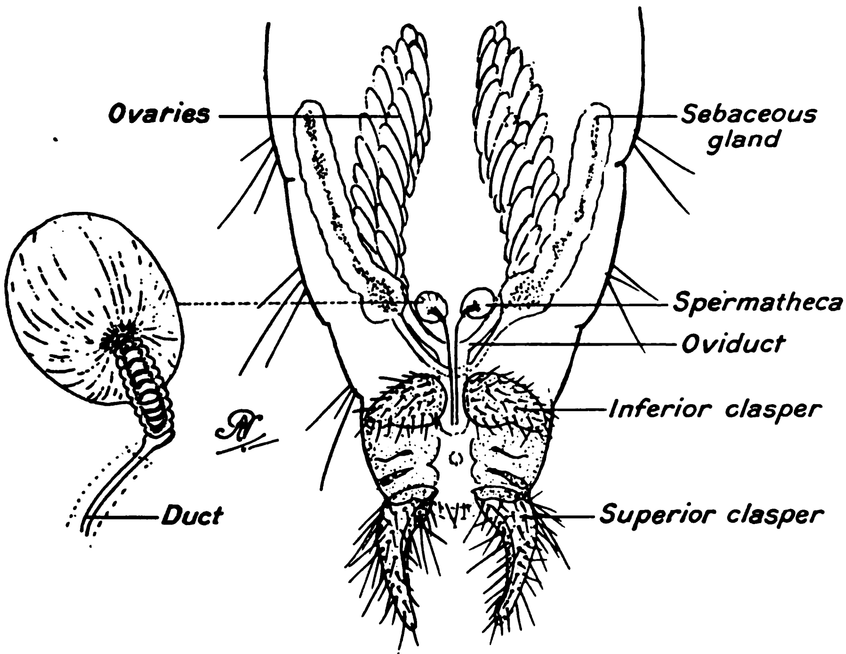

FIG. 11.—Female generative organs of *Phlebotamus*.

Sexual Organs of the Male (fig. 12).

The external characters of the male armature or copulatory apparatus have already been discussed (p. 34), and although the internal sexual organs have been but briefly studied, from preparations examined in optical section, yet a brief account of them may not be without interest. These consist of the following :—

The testes.—These may present a somewhat variable outline, though normally they are elongate-ovate ; they are distinctly paired and widely separated, each possessing its own duct, which enters the seminal vesicle at its anterior lateral margin.

The seminal vesicle consists of a large pyriform sac, the proximal portion of which gradually narrows and merges into the short, tubular, ejaculatory duct.

The ejaculatory duct is connected with a singular morphological

structure which, together with the chitinous rods, presents a slender and somewhat club-shaped though cylindrical process. The outer wall of the swollen portion is formed of thin transparent chitin; and occupying a central position is a piston-like rod which is dilated at both extremities; the distal portion somewhat resembles an inverted bulb, the opposite dilatation forming a more or less spherical sac. The space between the central structures is seen

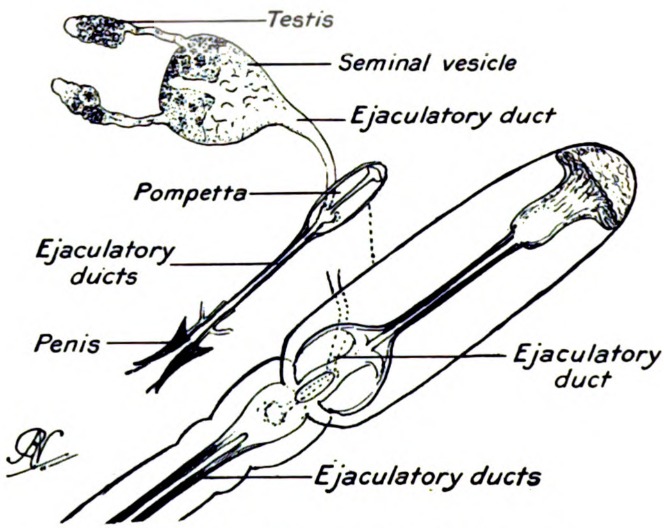

FIG. 12.—Male generative organs of *Phlebotomus*.

to contain delicate muscular fibres; and the ejaculatory duct leads into the spherical cavity at the lower end of the piston-like rod. Grassi's interpretation of the mechanism of this structure is that it acts like a little pump (*pompetta*), and regulates the exit of the spermatozoa. Beyond this structure the ejaculatory duct is protected by two slender, hair-like rods, which are highly chitinized and form the "intromittent organ," which has already been described (p. 34) as extending into and in some cases considerably beyond the penis-sheath or juxta.

OVIPOSITION OF PHLEBOTOMUS IN CAPTIVITY.

The act of oviposition was observed on several occasions and was not without interest, as the insect assumed a position which seemed altogether unique and extraordinary. In the first instance, a female with ripe ova was placed in a small glass-topped box, the bottom of which was within focal distance of a lens magnifying eight diameters. She was supplied with blotting-paper which had been soaked in clean water. On placing this in the box the insect

immediately alighted upon it, brought her proboscis into contact with the paper, and after a few seconds appeared to be perfectly intoxicated and helpless. Unfortunately, she struggled away and was finally hidden beneath the paper, so that further observations at the time were impossible. After an interval of a few minutes she reappeared, crawled up the side of the box, and one and a half hours later seemed as active as when first captured. On the following day, at 9.30 a.m., a fresh supply of wet blotting-paper was placed in her cage, when in less than sixty seconds she alighted upon it and assumed the same extraordinary attitude as on the previous evening at 6 p.m., collapsing immediately and placing her legs so that the middle and hind pair were crossed behind the abdomen, the front pair remaining almost in a normal position. The abdomen was then elevated and extended to the full and three eggs were laid at short intervals. Each egg appeared under the lens as a tiny translucent drop of fluid, and was ejected with considerable force to a distance equal to about three times that of the length of the abdomen. This process lasted for about two minutes, and afterwards the female crawled slowly away and up the side of the box, appearing weak and fatigued. Here she remained almost motionless for nearly three hours, gradually raising the whole of the body until it assumed a normal resting attitude.

On removing the blotting-paper which had been placed in the cage the previous evening, seven additional eggs were found, and these were evidently laid the previous evening when the insect was observed to go through the evolutions which have just been described. At 12.30 a.m. the same day she repeated the process when freshly moistened blotting-paper was supplied. On this occasion two eggs were laid, and these were found attached together side by side. At 5 p.m. two additional eggs were laid, the same curious attitude being assumed as before, but although frequently supplied with fresh wet blotting-paper she did not produce any more eggs, and at 10 p.m. she died. On making an examination of the abdomen it was found to contain eight fully developed ova, so that it is quite evident that this female had laid eggs elsewhere and previously to her capture.

The act of oviposition was seen on subsequent occasions, but in two instances the females died after remaining in a collapsed condition for periods of two and a half hours, and three hours and three-quarters, respectively. Both examples had their abdomens well filled with ripe ova, and had apparently not laid any eggs before they were captured.

(*To be continued.*)

THE ANATOMY AND LIFE-HISTORY OF *AGCHYLOSTOMA*[1] *DUODENALE* (DUBINI).[2] BY PROFESSOR A. LOOSS, PH.D.

ABSTRACT by MAJOR S. L. CUMMINS.
Royal Army Medical Corps.

IN this book the author deals very fully not only with the life-history of this parasite, but also with the literature existing on the subject, much of which he subjects to expert criticism from the point of view of the biologist; and he makes his remarks much more intelligible to the average medical man by an excellent preliminary section dealing with the comparative anatomy, classification, and development of the nematodes.

It would be impossible to give an adequate account of this notable work in the space at our disposal, but Professor Looss calls attention to the difficulties which await the medical man who desires to work at the prevention or even make a diagnosis of ankylostomiasis with no better guide than a text-book on tropical medicine, and it seems worth while to attempt a summary of portions at least of this volume. Officers desiring to consult the original can obtain a copy on application to the Director, Egyptian School of Medicine, Cairo.

The fact that the *Ankylostoma duodenale* in various stages of its development presents points of resemblance to the corresponding stages of other nematodes has given rise to many errors, several of which are discussed by Looss in the present volume; much of the confusion seems owing to the fact that the text-books, while paying as much attention as space will permit to *A. duodenale* itself, give no account of allied worms parasitic in animals other than man or

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[1] *Agchylostoma duodenale.* This spelling is the form under which the name was originally published by Dubini in 1838, and was adopted by Looss in the first part of his work in compliance with a proposition made by Stiles, to the effect that the original spelling of any scientific name should be preserved by subsequent authors. Looss now writes me that he retained *Agchylostoma* in the second part of his work for uniformity's sake, but has since then received numerous declarations from various helminthologists and biologists saying that they will never adopt this spelling on account of its obvious incorrectness. Under these circumstances, he finds it advisable to return to the familiar form *Ankylostoma*, which, though not latinized, yet represents the correct transliteration of the component Greek words ἀγκύλος and στόμα.

[2] Volume IV. of the "Records of the School of Medicine, Cairo."

living free in nature. Looss's work, with its clear exposition on the subject of the nematodes, should go far towards making good this defect in medico-helminthological literature.

The recognition of *A. duodenale* from *Necator americanus* should not be difficult if the following points be remembered.

Naked-eye Appearances.—*Ankylostoma* appears to have approximately the same diameter from end to end, the male being only slightly thinner than the female. In *Necator* the head-end is so much narrowed as to appear almost pointed and the male is altogether decidedly thinner than the female. The dorsal curvature of the anterior end is much more pronounced in *Necator* than in *Ankylostoma*. Finally, copulating pairs when seen, as after vermifuges or in post-mortem examinations, show the well-known Y-shaped figure; but in *Ankylostoma* the male—almost equalling the female in thickness—is attached to the body of the latter *behind* the middle, while in *Necator* the decidedly thinner male is attached *in front* of the middle, due to the different relative positions of the genital aperture in the females of the two species.

The principal microscopic differences have been summarized elsewhere, and need not be repeated here. *A. duodenale* probably only affects man, but *N. americanus* is less specific in its demands on its hosts, as it is found both in man and in the gorilla (not yet in the chimpanzee).

Summary of Life-history.

Before discussing the life-history it is well to call attention to a confusion in terminology emphasized by Looss. The word "embryo" should only be applied to *stages taking place inside the egg-shell,* while after the egg-shell is quitted the immature organism *is* and should be called a *larva.* Bearing this in mind, it may be said that the whole individual life of the *A. duodenale* falls, like that of other nematodes, into six stages, the embryonic, the four larval periods separated by ecdyses, and the adult stage.

The sexually mature adult worms make their habitat in the human intestine, and here the females produce eggs which are passed in the fæces of the host.

The chief characteristics of the eggs are supplied by their *shell,* which is: (1) Almost cylindrical in shape with bluntly rounded poles; (2) quite colourless; and (3) so thin that under *medium enlargements* it appears as a *single* line. Their content, originally represented by the rounded egg-cell, does not advance much in development while in the human bowel, so that it is rare to find

the egg-cell divided into more than four or eight parts *in the fresh* fæces; this fact may help in diagnosis, the eggs of *Oxyuris vermicularis* having, as a rule, reached the tadpole stage when the fæces are deposited. The latter are also characterized by a sharp *double* outline and a ventrally flattened shell. The development of the eggs now continues *outside the host*, the egg-cell division going forward until the morula stage is reached, which passes in turn into the tadpole stage, in which the body begins to show the primordia of its future organs, and sluggish movements are to be observed. Finally, when the embryo has attained about four times the length of the shell the granules which rendered its body opaque in the early stages disappear, and the mature embryo is recognizable by its clear glistening appearance.

The shell now bursts and the embryo becomes a free larva, about 0·25 mm. in length by 0·017 mm. in thickness. The thickening of the fore-part of the body is marked in young larvæ and represents a last survival of the embryonic tadpole form. The head-end is fairly blunt, while the tail tapers from the anus to its extremely fine tip in *an almost uniform manner*, this latter being an essential feature of the *Ankylostoma* larva. The *most* characteristic feature, however, is the sharply outlined buccal cavity of a long cylindrical shape and with a slight widening at its posterior end; another important character being the small genital primordia.

For a complete description of the young larva, the original work must be consulted. The digestive apparatus, being essential for the organism, is well developed, the mouth aperture leading into the cylindrical buccal cavity, and the œsophagus displaying the rhabditiform type, but with the three sections not nearly so sharply marked off from one another as in the *Rhabditidæ*, a point which helps in differentiating between the young *Ankylostoma* larva and those of *Strongyloides stercoralis* or of the free-living nematodes. The chyle-intestine, with its well-known zigzag lumen, follows the œsophagus. The anus is situated just where the body begins to slope off into the tail. As the larva feeds and grows its early transparency is lost as granules of nutritive matter are stored in its cells. The zigzag appearance of the intestines is gradually lost and this organ assumes the aspect of a thick granular strand traversing the body-cavity in a straight line. The skin, too, begins to show the changes which lead to the first ecdysis, being raised a little from its substratum and its inner surface being ringed far more sharply than the outer.

Finally, the skin is completely loosened and a distinct new skin

appears under the old. The larva is now ready to undergo its first moult or ecdysis.

During this "first larval period" the organism grows considerably, the increase in size being most marked in the part of the body corresponding to the chyle-intestine.

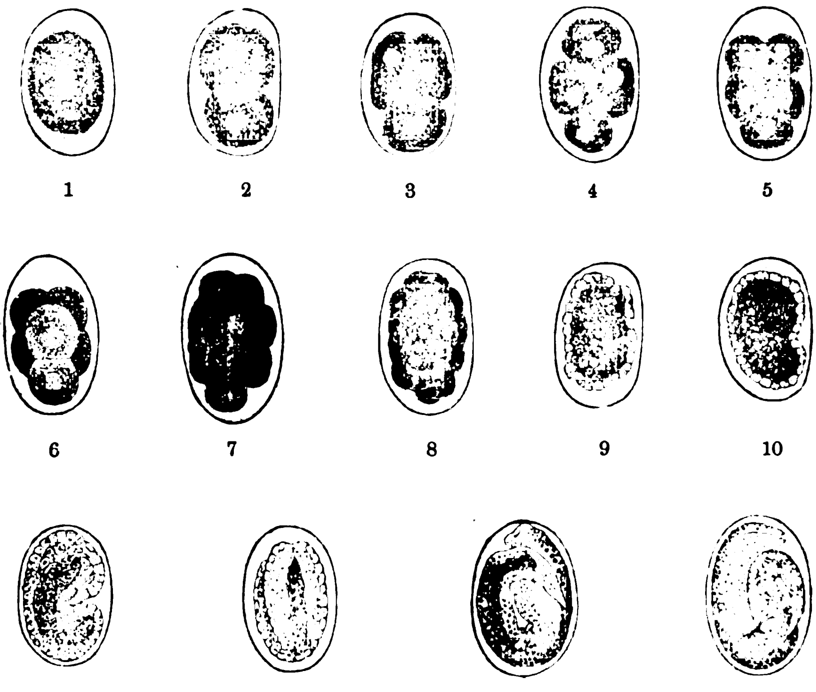
The extent to which this is the case is shown by the fact that the œsophagus, in the youngest larva, corresponds to almost half the distance between the tip of the head and the anus, but at the end of the first larval period only corresponds to one-third of this distance. The total length of the larva now averages 0·353 mm.

The first ecdysis now takes place. The old skin, hitherto serving as an effective protection to the larva, becomes permeable by the fluid of the surrounding medium, and separates from the underlying new integument by absorption of water from without. The larva, after protracted efforts, finally breaks through the old skin and escapes from it, thus completing its moult, and entering upon the "second larval stage."

The principal external character by which the second stage may be recognized is that the lateral lines, formerly projecting as a single keen free edge on either side, now form distinct bands, each with two parallel margins raised a little above the general surface of the skin along the whole length of the body. This feature can be recognized only under very high magnification. During further growth, no far-reaching internal changes occur at first; but the already existing parts become more sharply separated. When the larva has attained a length of about 0·5 mm. fresh changes make their appearance in it which represent the preparation for the second ecdysis. The first and characteristic sign of the approaching moult is the closure of the mouth. While hitherto this was always found gaping, and in profile showed about the same breadth as the mouth cavity which follows it, its borders now collapse and show in optical longitudinal section as a simple line. The musculature of the body increases in thickness and its striations become discernible. The œsophagus lengthens, its division into three parts becomes less marked, and the œsophageal valves of the bulb are difficult to see at this stage. During these changes the skin becomes separated from the body and a new one formed beneath it, just as in the first ecdysis. When the old skin has become lifted from its substratum, the tail begins to contract, becoming also somewhat thicker, so that finally the tip of the new tail comes to lie almost in the middle of the old.

When the old skin has completely separated from the body,

the former linings of the mouth-cavity and rectum are found adhering to it. At first it lies rather closely around the body, but gradually the space between the two skins increases owing to a shrinkage of the larva. "With the completion of these changes, the larva has reached the conclusion of its development in the open," and now is not only ready to begin its parasitic life at any moment, but *must* become parasitic in order to develop further.



1 to 14.—Stages in development of the embryo of *Agchylostoma duodenale*. × 310.

The mature larva may be recognized not only by its envelope of old skin, or "sheath," as it has been called, but also by the fact that its movements, formerly chiefly confined to lateral flexures, now assume a serpentine character with active progression, provided that the organism can find a *point d'appui*. Thus, although the larvæ sink in water for want of the resistance that would enable them to move forward, they glide rapidly out of

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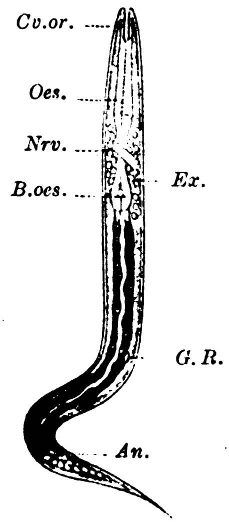

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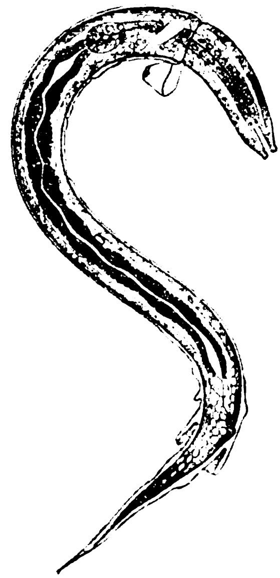

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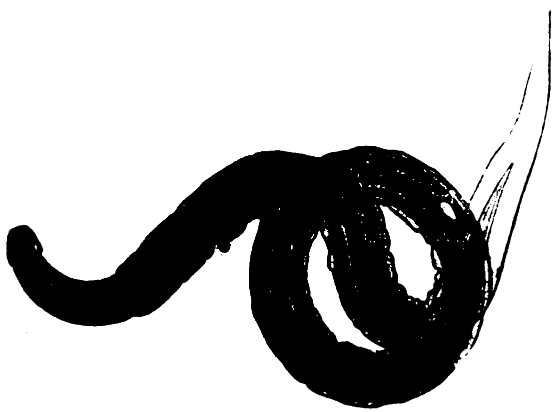

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× 310.

15.—Freshly hatched larva.
16.—End of first larval stage (the first ecdysis).
17.—" Mature " larva.
18.—Mature larva shedding its " sheath " (old skin).

the field of the microscope if the preparation is under a cover-glass.

This power of movement, together with the closure of the mouth which marks the end of the feeding period of the free larva, makes the organism independent of the fæcal mass in which it has hitherto grown and capable of wandering in search of the host that is necessary to its further development. The nourishment stored up in its body-cells suffices for long periods of waiting, should a host not become available at once. If now the mud or fluid containing such mature larvæ comes in contact with the skin of a human being, the larvæ at once proceed to enter the skin either through hair follicles or at any point where a roughness offers the *resistance* that is needful to evoke the serpentine and boring movements already mentioned. For the same reason a suspension of the larvæ in mud is much more favourable to their entry through the skin than suspension in water. As the larvæ bore into the skin, they leave their "sheaths," or old skins, behind them on the surface, thus completing their second moult. Forcing their way into the subcutaneous areolar tissue, they gain entrance to lymph-spaces or small veins, and are carried into the blood-stream, and, finally, by way of the right side of the heart, to the lungs, where they make their escape from the blood-vessels and enter the alveoli. Thence they ascend the bronchioles until, travelling by way of the bronchi, trachea and larynx, they make their way to the œsophagus of their host, are swallowed into the stomach, and pass on into the small intestine. During this transit from the lungs through the air-passages, the larvæ feed and grow, traces of a provisional mouth capsule and a loosening of the skin preparatory for the third ecdysis already being visible in some of those that have reached the upper areas of the trachea. The third ecdysis takes place on reaching the intestine, and here further growth leads up to the fourth ecdysis, which leaves the organism in the definitive shape in which it reaches sexual maturity after about a week's time.

As a commentary on the above brief history of the worm it may be noted that it is impossible to contract the disease through ingestion of the ova or of the immature larvæ, so that contamination of food or drink by the *fresh* fæces of a patient is not a means of infection in ankylostomiasis.

It should also be borne in mind that the adult worms present in the bowel cannot exceed in number the larvæ that originally penetrated the skin; so that, unless fresh infection takes place,

the duration of the attack is limited to the time of survival of the worms, probably about five years.

The larvæ must be *mature* before they can set up the disease. This greatly narrows down the chances of oral infection, but Looss is careful to point out that infection through the mouth can and does occur. It is obvious, however, that it is an exceptional and fortuitous occurrence, and that the dermal route is the normal one for the *A. duodenale* and *N. americanus*.

We may now turn to the diagnosis of ankylostomiasis by the discovery of eggs in the fæces. It is usually quite easy to find these, but difficulty may arise where there is much bulky particulate matter in the fæces which prevents the making of sufficiently thin preparations. In this case, Looss recommends the following plan: "A small quantity of the fæces is placed on the right hand side of a slide and there diluted with the necessary amount of water, without, however, being spread out much. Then the foreign bodies are pushed to the right with a needle, except one small particle the thickness of which corresponds to the thickness of the preparation desired.

If a cover-glass is now placed so that its edge rests precisely on this isolated particle, the liquid present, together with the eggs, will be drawn under the cover-glass, while the coarser constituents will be kept back. In this way, a preparation both thin and free from large particles will be obtained, in which the eggs are easily found on its being examined with a low power and a partially closed diaphragm or with the condenser racked down so as to bring up the outlines of the objects in the fluid.

Again, where the eggs are few and a rapid search is desired, a modification of a method first proposed by Giles has been found very convenient. It consists in rubbing down a particle of fæcal matter in a drop or two of a concentrated aqueous solution of methyl-green, spreading it in a thin film and observing it without a cover-glass under full light. Any eggs present appear as regularly outlined white dots against the dark outline of the stained mass.

Search for Adult Worms.—To find the adult worm in fæces, after the administration of an anthelmintic, the following procedure is advised:—

The vessel containing the fæces is placed beneath the tap and water allowed to flow in a strong current into it, so as to mechanically break up the fæcal matter as much as possible. When the vessel is full, the tap is turned off and the contents

allowed to settle, so that all the heavier constituents, with any worms present, sink to the bottom. Three minutes are quite sufficient for this purpose. The turbid fluid is now poured off

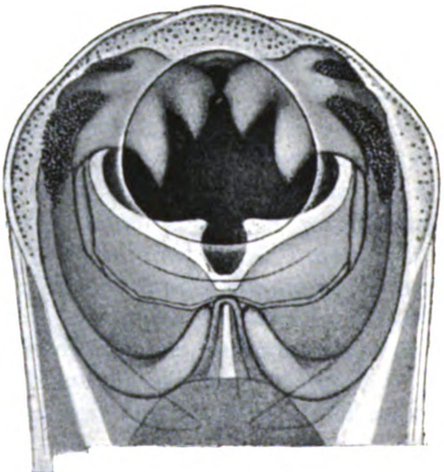

FIG. 19.—Mouth capsule of *Agchylostoma duodenale.*

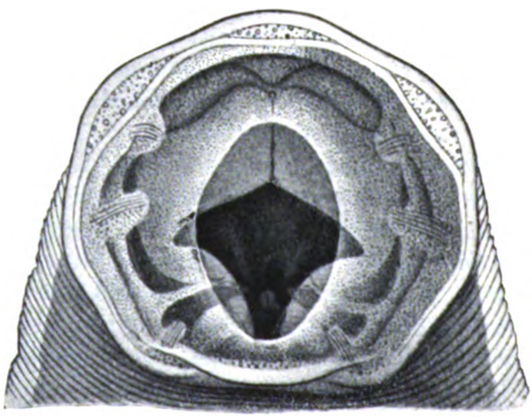

FIG. 20.—Mouth capsule of *Necator americanus.*

by a slow and uniform inclination of the vessel, until the sediment is about to escape with it. The vessel is now filled again with water, sedimented, and the fluid poured off as before. The process is repeated until the fluid comes off quite clear, when the

sediment is poured into one or more large flat glass dishes and examined against a dark ground. This method will also serve excellently for the discovery of detached tape-worm heads, or

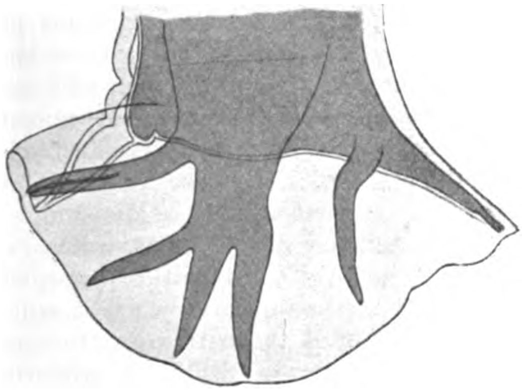

FIG. 21.—Bursa of *Agchylostoma duodenale*.

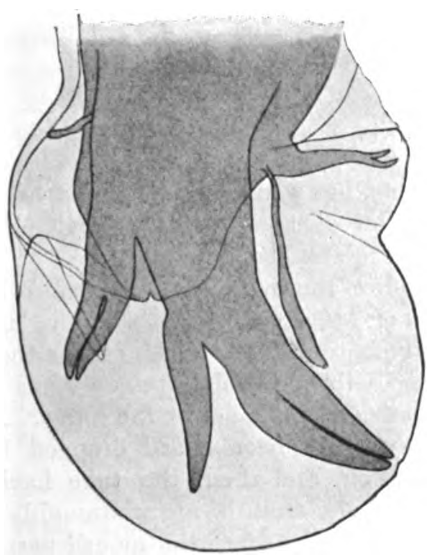

FIG. 22.—*Necator americanus*.

for the search after small worms, such as *Oxyuris* (males), *Trichostrongylus*, or even *S. stercoralis*, a lens being used to supplement the sight.

If it is desired to make cultures of the larvæ from fæces containing ova, the following points should be remembered :—

(1) Air is necessary for the development of the larvæ.

(2) Marked putrefaction brings about the death of the larvæ. To obtain access of air, the fæces should be spread thinly on the bottom of a shallow glass vessel, and to prevent putrefaction it is well to mix them with *charcoal;* black bone charcoal, finely powdered, free from coarse grains and not markedly acid in reaction, is particularly suitable for this purpose. A mixture of about equal parts of charcoal and fæces answers best. If the latter is hard, water must be added. A consistency similar to that of butter or lard at room temperature may be aimed at.

To extract the larvæ after development, water may be poured on the surface of the slightly dried culture mass, left in contact for a few minutes, and then poured off, when it will be found to contain larvæ; or a portion of the culture mixture may be placed on the surface of several plies of dry linen, which are then tied up round the mass, and lowered into water in a jar. After a few minutes the larvæ swarm out through the linen bag and sink to the bottom of the water. The methods succeed best at temperatures between 18° and 25° C.

Preservation of Specimens.

Adult Worms.—The worms should be added to the preservative *while still alive.* The best specimens are obtained from post-mortem examinations, but good ones can also be had from stools passed after exhibition of a vermifuge, provided the worms are collected *at once* on the stool being passed.

The worms require thorough *washing* before being preserved, as, under intestinal or fæcal conditions, they are usually enveloped in mucus, intestinal contents, &c., which render thorough examination difficult or impossible, especially when remaining within the mouth capsule or between the lobes of the bursa. For this purpose the worms, as they are collected, are dropped into a test-tube containing salt solution, and then, the tube having been closed by the application of the thumb, are thoroughly shaken. Very thorough shaking is needed to free the mouth parts from adherent intestinal epithelium and the bursa from intestinal contents.

The live worms will stand this without injury, but dead worms are likely to break up in the process. The worms are now allowed to sink to the bottom, the turbid fluid poured off, and the worms washed with clean salt solution.

The best preservative is 70 per cent alcohol, warmed until the first bubbles begin to rise: if allowed to boil briskly it tends to make the worms brittle, so the heating must stop short of this point. In the hot alcohol the worms are instantly killed and fixed in an extended position. They can be kept for years in 70 per cent alcohol.

For mounting and examination, the specimens should be *cleared*, and this is best done in glycerine.

If, however, the worms were transferred directly from alcohol to pure glycerine, shrivelling would result, so it is better to transfer them to a mixture of 100 parts of 70 per cent alcohol with 5 parts of glycerine, placing the vessel containing them at 50° to 55° C. At this temperature the alcohol gradually evaporates and the worms are finally left in pure glycerine.

A similar process may be employed for preserving the eggs, but the fæces containing them should be first washed and sedimented as recommended by Stiles.

We cannot end better than by quoting briefly the author's account of the three important genera, *Ankylostoma*, *Necator* and *Uncinaria*. As members of the Order Strongyles, all possess, in the male sex, a bursa, and as members of the family of the *Ankylostomidæ*, a horny mouth capsule with its aperture pointing dorsally. The three genera may be divided into two sub-families.

I. Sub-family *Ankylostominæ*.

More or less funnel-shaped mouth capsule, its walls on the ventral side, especially towards the anterior edge, provided on each side with two longitudinal thickenings projecting outwards like ridges. Floor of the mouth cavity with one pair of inner ventral teeth. Aperture of dorsal œsophageal gland situated in the wall of the mouth capsule. Bursa of the male *closed* all round. Only the terminal part of dorsal ray is cleft. The course of the genital tubes chiefly longitudinal. Parasites of carnivora; one species is a parasite of man.

Type Genus. Genus *Ankylostoma*.

At the ventral edge of mouth-capsule strong hooks, the tips of which are bent backward. The lateral lobes of the bursa are broader than they are long. The genital tubes run in the main longitudinally, but secondarily form strong transverse folds. Inhabitants of warm or moderate climates.

Species.

(1) Type Species. *Ankylostoma duodenale* (Dub.), male about 9 mm.; female about 12 mm. long. Edge of mouth-capsule with two hooks on each side, the outer one always slightly larger than the inner, which latter carries on its inner side a small accessory tooth. Lateral lobes of bursa considerably broader than long. Rays of medium thickness. Only observed in man.

(2) *Ankylostoma caninum* (Ercolani).

Male about 11 to 12 mm., female 15 to 16 mm. Edge of mouth-capsule with three teeth on each side. The lateral lobes of the bursa about as broad as long; the rays remarkably slender.

Observed in *Canidæ* and *Felidæ*.

(3) *Ankylostoma malayanum* (Alessandrini).

(4) *Ankylostoma ceylanicum n. sp.*

(5) *Ankylostoma pluridentatum* (Alessandrini).

Genus *Uncinaria.*

Mouth-capsule lengthened out, and distinctly funnel-shaped. No hooks at anterior edge. In their place, plates with cutting edges, springing from the sides towards each other, and more or less covering the ventral half of the oral aperture. Bursa well developed, lateral lobes longer than broad. The genital tubes, in their longitudinal course form only a few secondary transverse coils. Parasites of carnivora.

Species.

(1) *Uncinaria criniformis* (Rud.).

(2) *Uncinaria polaris n. sp.*

II. Sub-family *Bunostominæ.*

Mouth-capsule almost spherical, small, and its ventral wall without ridge-like thickenings. Inner ventral teeth as in the *Ankylostominæ.* The aperture of the dorsal œsophageal gland lies on the tip of a cone which springs freely from the dorsal half of the floor of the mouth-capsule into the cavity. The base of the cone is clasped by other tooth-like plates projecting freely from the sides into the lumen. Bursa of the male closed all round; the dorsal ray split to near its root.

Type Genus. *Necator* (Stiles).

Mouth-capsule small, aperture narrowed anteriorly by cutting plates similar to those of *Uncinaria.* On each side of the cone of dorsal œsophageal gland, one tooth-like plate with smooth edges.

Coils of the genital tubes numerous and close. Externo-dorsal ray thin, especially at root. Spicula of the male barbed at the end.

(1) Type Species. *Necator americanus* (Stiles).

Male about 8 mm. Inner ventral teeth of mouth-capsule rather large, and projecting far into the lumen. Cutting plates of mouth with angular free edges. Lateral lobes of the bursa about as broad as they are long, rays of medium thickness.

(2) *Necator exilidens n. sp.*[1]

CONCLUSION.

In concluding this brief extract of what can only be described as a monumental work, we must express our gratitude to Professor Looss for so clearly placing at our disposal in one volume the evidence for and against the several vexed questions that still exist on the subject of *Ankylostoma duodenale*, or that existed prior to the publication of this work; for the reader will, we think, be inclined to regard them as now finally settled. The theory of heterogenesis of *Ankylostoma duodenale* is completely disposed of, the author showing most conclusively that the evidence adduced in its favour was founded on observations of nematodes other than the worm in question.

The very full and thorough chapters on "ground itch" are exceedingly interesting and convincing. The book is full of close and philosophic thinking, and the trenchant style of the author makes it delightful reading even apart from the great interest of the subject. Our thanks are due to the Director of the Egyptian School of Medicine for his kind permission to reproduce some of the illustrations from Volume IV. of the Records, and to Professor Looss for his great kindness in reading through and revising this summary of his work.

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[1] New name for "*Necator africanus*" 40055, which, according to Stiles, was preoccupied by *Necator africanus* Harrison, 1910 (*N. americanus* Stiles, 1902 renamed).

NOTE FOR GUIDANCE IN THE WRITING OF MEDICAL APPRECIATIONS.[1]

By Colonel T. P. WOODHOUSE.

Before commencing to write an appreciation, address to yourself these questions :—

(1) What is the task before me?

(2) What are the means at my disposal for carrying it out?

(3) What are my plans for best accomplishing it?

To enable you to answer question (1) it is first necessary to state concisely the *Military Situation*. It must be remembered that if the appreciation is to be of any practical value, particulars of the "military situation" must be obtained first hand from the Staff. Not only from the General Staff with regard to the contemplated operations, but also from the Administrative Staff. Information is required regarding what transport, roads, and railway facilities can be placed at the disposal of the medical authorities. The mistake of entering too much into surmises and details regarding strategical and tactical problems is frequently made.

It is only needful to record details which immediately concern the *Medical Problem* confronting you. Thus the following items should be dealt with :—

(1) A brief remark regarding the general military situation.

(2) The approximate strength and position of your force.

(3) The probable nature of the prospective engagement, and its imminence or otherwise.

(4) The position and approximate strength of the enemy.

The subjoined may be regarded as a typical example of what you should record in your appreciation of the

(A) Military Situation.

(*a*) A raiding force of Blueland is expected shortly to land on our coast. All the available forces of Redland have been mobilized to repel it.

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[1] These notes were written with special reference to appreciations submitted by Royal Army Medical Corps Officers at a War Game played in Edinburgh, in December, 1910.

The troops supposed to be employed in this War Game were entirely composed of Territorial Force units.

(*b*) The strength and position of our (REDLAND) force is as follows :—

*   *   *   *   *   *

(*c*) The prospective engagement will consist principally of the nature of the defence of a position.

(*d*) The Lowland Mounted Brigade and Highland Cyclist Battalion are likely to become engaged at once, the Lowland Division not until a later period. It is not probable that either the Glasgow Yeomanry or 10th Cyclist Battalion will be engaged at all.

(*e*) The BLUELAND Force, whose strength is not likely to exceed ——, is expected to land somewhere on the coast of ——.

Now, consider what use you can make of the information contained in the above review of the military situation, to help you to solve the problem before you, to answer question (1) :—

(1) Knowing the strength of your force in the field, you can make a rough estimate of the number of sick which is likely to daily accrue (0·3 per cent), which you must arrange to transport to the general hospitals.

(2) A knowledge of the strength of your force likely to be engaged, considered in conjunction with the nature of the prospective engagement, enables you to make a rough estimate of the number and character of the casualties you will have to deal with, and the amount and form of transport that will be required to move them from the battlefield to the clearing hospitals, or equivalents, and on to the base hospitals.

(3) Being aware of the position of your force you are enabled to :—

(*a*) Arrange for the movements of mobile field medical units to the area occupied by that portion of your force to which you elect to allot them.

(*b*) Form an appreciation of the area in which the forthcoming battle will be fought, and your consequent line of evacuation therefrom, and the resources at your disposal for this purpose.

(*c*) Arrange the position of your improvised clearing hospitals and advanced depôt of medical stores, or their equivalents.

(*d*) Choose the most suitable general or military hospitals for the reception of sick and wounded, and the location of the base depot of medical stores, or its equivalent.

(4) The value of the knowledge of the imminence, or otherwise, of the engagement is obvious.

(5) By knowing the approximate strength and probable line of

advance of the enemy, you can estimate the probable number and locality of their casualties, whom it is possible you may have to provide for.

From the data now at your disposal a definite answer can be given to question (1). Here it is important never to lose sight of the fact that the only object in fighting a battle is to win it. To attain that end all administrative medical arrangements are subservient to the requirements of the actual fighting line during the progress of the battle.

(B) THE MEDICAL PROBLEM.

(1) To arrange for the daily evacuation and distribution of the sick accruing from the force, viz., 0·3 per cent of the strength.

The number of sick occurring daily will be approximately:—

From Lowland Division	57
,, ,, Mounted Brigade	6
,, Cyclist Battalions	3
,, Coast Defence Troops	30

Roughly 100 sick daily from the whole force.

(2) To arrange for the collection on the battlefield, and subsequent evacuation and distribution, of casualties in the forthcoming battle.

The following is an estimate of the number of casualties and their character as regards form of transport required for them, which may be expected from each portion of the force:—

(*a*) *Lowland Mounted Brigade.*—Is likely to become heavily engaged, and 15 per cent of casualties, excluding killed, may be estimated. This gives a total of 330 casualties, roughly classified to consist of:—

88 able to walk
180 requiring sitting-up transport
47 ,, lying-down ,,
15 unfit to be moved.

The number of killed may be estimated at about 80.

(*b*) *The Lowland Division.*—Will probably occupy an entrenched position, and their casualties may be estimated at 10 per cent, excluding killed. This estimate gives a total of 1,900 casualties, roughly classified to consist of:—

380 able to walk.
1,140 requiring sitting-up transport.
285 ,, lying-down ,,
95 unfit to be moved.

The number of killed may be estimated at about 475 to 500.

(*c*) *The Highland Cyclist Battalion.*—Casualties not likely to exceed 5 per cent excluding killed—roughly 25—may be classified as :—

5 able to walk.
15 requiring sitting-up transport.
4 „ lying-down „
1 unfit to be moved.

The number of killed may be estimated at 6.

(*d*) *The Glasgow Yeomanry* and 10*th Cyclist Battalion* will most probably not furnish casualties.

(*e*) *Coast Defence Troops.* — Probable number of casualties difficult to estimate—roughly a total of 770, excluding killed. Classification of casualties for transport will be :—

140 able to walk.
480 requiring sitting-up transport.
115 „ lying-down „
35 unfit to be moved.

The number of killed may be estimated at about 100.

(*f*) The approximate number of casualties requiring lying-down accommodation in transport from the battlefield to the clearing hospitals will be 450, and those requiring sitting-up accommodation will be 1,820; 613 will be able to make their way on foot to the clearing hospitals, but will require transport from thence to the general hospitals.

Accommodation in the neighbourhood of the battlefield must be provided for the 146 cases unfit to be moved from thence.

(3) Arrange the organization for the evacuation of wounded.

(4) Arrange means and lines of distribution to the general hospitals.

(5) Arrange to establish the equivalents of an advanced depot and base depots of medical stores.

You have now answered question (1), the task before you is detailed.

It is now necessary to answer question (2): "What are the means at my disposal for carrying it out?"

In preparing the solution you must divide the means at your disposal into two categories: (*a*) The means already provided; (*b*) those you must improvise, and the resources for doing so.

First category, the means already at your disposal.—These consist of:—

(1) The medical detachments (stretcher-bearers, &c.), with units.

(2) One mounted brigade field ambulance.

(3) Three field ambulances.

(4) One general hospital at EDINBURGH and two at GLASGOW.

(5) The returning empty supply vehicles, for which a rendezvous must be arranged.

(6) The various men's and women's voluntary aid detachments of the British Red Cross Society, available in the theatre of operations.

Second category, the additional means which must be improvised.—It is evident, from the enumeration of the means at your disposal, that a considerable improvisation is necessary on the following lines :—

(1) As regards the local mobile force :—

(*a*) The transport available to convey casualties from the battlefield and on to the clearing detachments is inadequate.

Take the Lowland Division, for instance—you have to provide transport for 280 lying-down, and 1,125 sitting-up cases, according to the estimate of casualties. The 30 ambulance wagons of the field ambulances will accommodate : 60 lying-down cases and 120 sitting-up cases. The empty supply vehicles will provide transport for about 174 lying-down cases. The Divisional Transport and Supply Column has 38 supply vehicles ; 26 are horse transport wagons, and 12 are motor-lorries (War Establishments, T. F., 1911). It is computed that 3 lying-down casualties, without stretchers, can be transported in each horse-wagon, and 8 in each motor lorry.

On consideration of the above means to convey the casualties from battlefield to rendezvous of supply vehicles—this would necessitate over five journeys to and fro of your ambulance wagons —an impossibility !

From Rendezvous of Supply Vehicles to Clearing Hospitals or Equivalents.—The supply column is only available for one journey daily to the rear, and therefore further transport for the remaining 106 lying-down cases and the whole of the sitting-up casualties is required. So that improvisation of transport for reinforcing the field ambulances and supply vehicles must be arranged. Local resources will most probably meet all requirements.

(*b*) The Lothian Brigade and attached troops have no field ambulance allotted to them. A nucleus of one could be formed by detaching one section of No. 2 Field Ambulance, and it would be necessary to improvise the remaining ambulance transport required for this unit ; local resources can be calculated as enabling you to do this.

(c) Ambulance transport must be improvised for the Glasgow Yeomanry and the two cyclist battalions, as they have no medical units allotted to them.

(2) Clearing hospitals, or the equivalents, for the mobile force and the coast defence troops must be organized, as none exist. The equipment can be obtained locally, and the personnel will be provided by the voluntary aid detachments of the British Red Cross Society.

(3) Ambulance trains from the clearing hospitals to the rail-base will be improvised at EDINBURGH and GLASGOW. Personnel for these will be provided by the Red Cross Society.

(4) At the rail-head, and at the rail-bases at EDINBURGH and GLASGOW, rest stations will be established by the Red Cross Society.

(5) Transport from rail-bases to general hospitals must be improvised at EDINBURGH and GLASGOW.

(6) Water transport to EDINBURGH for sick and wounded being feasible, steamers must be fitted up for this purpose, and personnel for rest stations at the embarking and disembarking centres, and on the steamers, will be organized by the Red Cross Society.

(7) The equivalents of one advanced depot and two base depots of medical stores must be organized, as no such regular units are allotted to the force.

You have now practically answered the question (2) regarding all the available means at your disposal for carrying out the task before you.

Before, however, you can consider you have entirely solved the "Medical Problem," there are certain other factors affecting the evacuation of the sick and wounded, which must be taken into consideration; these are:—

(a) The proximity, condition, and practicability of use of roads, rail, and water-ways, as regards:—

(1) Transport of sick and wounded from the battlefield.

(2) Choice of location of clearing hospitals and advanced depot of medical stores, or their equivalents.

(3) Rendezvous for ambulance trains and steamers, due regard being paid to facilities for entrainment and embarkation.

(4) Lines of evacuation available from rail-head to base.

(b) Climatic conditions prevailing.

(c) Attitude of inhabitants in the area of operations.

(d) If the enemy is a signatory of the Geneva Convention.

Let us now review the above points as regards the special scheme under consideration:—

(*a*) (1) The roads from the probable battlefield are numerous, conveniently placed, and metalled—ambulance transport can move easily along them. Arrangements must be made with the General Staff to use certain roads, so as not to interfere with the movements of troops and ammunition supplies.

(2) —— and —— are most suitable localities for improvising clearing hospitals and evacuating arrangements. If the former is found too congested for the purpose, —— might be selected.

(3) Two lines of evacuation are available from——, viz.: via STIRLING to GLASGOW, via FORTH BRIDGE to EDINBURGH.

(4) Ambulance trains could rendezvous at——, and —— sidings, and be sent on to ——, and ——, as desired. One train should always be held in reserve at each of these stations, and be replaced whenever it moves out with wounded. A railway rest station should be established at——

(5) Evacuation by water can be effected from —— to GRANTON for EDINBURGH.

(6) The equivalent of an advanced depot of medical stores should be improvised at ——, in proximity to the Clearing Hospital.

(*b*) The weather is wet and cold. Wounded must therefore be got under cover if possible. Roads will be somewhat heavy for wheeled transport.

(*c*) The surrounding inhabitants are friendly. Every assistance may therefore be expected from them in housing and transporting wounded.

(*d*) The enemy is a signatory of the Geneva Convention; wounded can therefore be abandoned under the treaty, and his casualties may also have to be succoured by us.

The medical problem is now defined. It only remains to formulate a definite plan of medical arrangements in order to complete your appreciation. This plan should take the form of orders. In drawing up your plan, you must not lose sight of the special position you occupy, and therefore the point of view from which the appreciation is written. It is necessary to do this, in order to form a just estimate of the scope of your duties, and thus necessarily of the correct items your plan must contain. Above all, never touch on such items as may warp the initiative of officers holding important posts under your command. Your plans must be unfolded precisely and intelligibly, and be capable of broad interpretation.

For instance, in this scheme you hold the position of D.M.S. (acting also as D.D.M.S., L. of C.), and must therefore remember you have serving under you: (1) The A.D.M.S., Lowland Division;

(2) the S.M.O., Forth Defences; (3) officials of the Scottish Branch of the British Red Cross Society.

The following, therefore, would be the form of your

(C) Plan of Medical Arrangements.

(1) The Mounted Brigade Field Ambulance would conform to the movements of the Brigade. Sick and wounded would be despatched to some point on the railway, which would be communicated to command headquarters, and an ambulance train ordered to evacuate them.

(2) The sick and wounded of the Lowland Division would be evacuated to the Clearing Hospital at ——, and from thence to the General Hospitals at Glasgow.

The A.D.M.S., Lowland Division, would ensure that all sick and wounded are evacuated to the Clearing Hospital in one day, additional transport being improvised locally for the purpose.

(3) The A.D.M.S., Lowland Division, would detach "C" section No. 2 Field Ambulance for duty with the Lothian Brigade.

(4) The S.M.O., Forth Defences, would (*a*) improvise locally additional transport, so as to bring the transport capabilities of "C" Section, No. 2 Field Ambulance up to that of a complete Field Ambulance. (*b*) Evacuate sick and wounded to the Clearing Hospital at ——, transport being improvised locally for the purpose. These would be despatched from thence to the General Hospital at Edinburgh.

(5) The A.D.M.S., Lowland Division, would arrange for sufficient ambulance transport being improvised for the divisional mounted troops at ——, sick from which would be despatched by ordinary passenger trains to the general hospital at Edinburgh.

(6) The Medical Officers in charge of the Highland and 10th Cyclist Battalions would improvise, locally, sufficient ambulance transport for each of their units.

The sick and wounded from the former would be despatched to the clearing hospitals at ——, or ——, and from the latter by ordinary train to the general hospital at Edinburgh.

(7) Arrangements would be made by the Red Cross Society as follows:—

(*a*) At Edinburgh.

(1) For the fitting out of, and personnel for, two ambulance trains, each to accommodate 100 lying-down and 200 sitting-up cases.

(2) A rest station at the Edinburgh rail base and landing-stage.

(3) Transport for conveying sick and wounded from rail-base and landing-stage to the general hospital.

(*b*) Similar arrangements would be made at GLASGOW.

(*c*) Clearing hospitals to be established at ——, and ——, and the necessary personnel provided.

(*d*) A rest-station at the embarking-stage at ——.

(*e*) A railway rest-station at ——.

(8) The equivalent of an advanced depot of medical stores would be improvised at ——, in proximity to the clearing hospital, the personnel being supplied for it from the latter unit.

(9) The equivalents of base depots of medical stores would be established at the military hospitals at EDINBURGH and MARYHILL (GLASGOW).

From the above notes the following appreciation is written:—

Appreciation of the situation at 5 a.m., December 10, 1910, from the point of view of the D.M.S. (also acting as D.D.M.S., L. of C.), NORTH REDLAND FORCE at EDINBURGH.

(Map used—ordnance survey 1" to the mile—sheets 40 and 41).

The points to be considered are:—

(A) The military situation.

(B) The medical problem.

(C) A definite plan of medical arrangements.

(A) THE MILITARY SITUATION.

(1) A raiding force of BLUELAND is expected shortly to land on our coast. All our available forces have been mobilized to repel it.

(2) The strength and position of our force is as follows:—

* * * * * *

(3) The prospective engagement will consist principally of the nature of the defence of a position.

(4) The LOWLAND MOUNTED BRIGADE and HIGHLAND CYCLIST BATTALION are likely to become at once engaged.

The LOWLAND DIVISION will not become engaged until a later period.

It is not probable that either the GLASGOW YEOMANRY or 10TH CYCLIST BATTALION will be engaged at all.

(5) The BLUELAND FORCE, whose strength is not likely to exceed ——, is expected to land somewhere on the COAST of ——.

(B) THE MEDICAL PROBLEM.

(1) To arrange for the evacuation and distribution of the daily sick accruing from the force (0·3 per cent of strength).

(2) To arrange for the collection on the battlefield, and subsequent evacuation and distribution of casualties in the forthcoming battle. The following is an estimate of their number, and their

character as regards form of transport required for them from the various portions of our force :—

(*a*) LOWLAND MOUNTED BRIGADE—estimated casualties 15 per cent of strength engaged = 330 casualties.

Character as regards transport :—

180 require sitting-up accommodation.
47 require lying-down accommodation.
15 will be unfit to move.
88 will be able to walk.

(*b*) LOWLAND DIVISION—estimated casualties, 10 per cent of the force engaged = 1,900.

Character as regards transport :—

1,140 require sitting-up accommodation.
285 require lying-down accommodation.
95 will be unfit to move.
380 will be able to walk.

(*c*) HIGHLAND CYCLIST BATTALION—estimated casualties, 5 per cent of the force engaged = 25.

Character as regards transport :—

15 require sitting-up accommodation.
4 require lying-down accommodation.
1 will be unfit to move.
5 will be able to walk.

(*d*) COAST DEFENCE TROOPS—estimated casualties = 770.

Character as regards transport :—

480 require sitting-up accommodation.
115 require lying-down accommodation.
35 will be unfit to move.
140 will be able to walk.

(*e*) The GLASGOW YEOMANRY and 10TH CYCLIST BATTALION—will probably not suffer any casualties.

(*f*) Grand totals of casualties as regards character of transport from battlefield to clearing hospitals are :—

450 lying-down accommodation.
1,820 sitting-up accommodation.

from clearing hospitals to general hospitals :—

450 lying-down accommodation.
2,438 sitting-up accommodation.

(3) Fix position and arrange for organization of clearing hospitals, or their equivalents.

(4) Arrange means and lines of evacuation from clearing hospitals to general hospitals.

(5) Arrange to establish the equivalents of an advanced depot and base depots of medical stores.

(6) The medical units at my disposal are :—

(*a*) The medical detachments with units.

(*b*) One mounted brigade field ambulance.

(*c*) Three field ambulances.

(*d*) One general hospital at EDINBURGH and two at GLASGOW.

(*e*) The returning empty supply vehicles of the divisional transport and supply column.

(*f*) Voluntary aid detachments of the Red Cross Society.

(7) It will be necessary to improvise the following transport and medical units :—

(*a*) Additional ambulance transport for the field ambulances and divisional transport and supply column.

(*b*) A field ambulance for the LOTHIAN BRIGADE.

(*c*) Ambulance transport for the GLASGOW YEOMANRY and CYCLIST BATTALIONS.

(*d*) The equivalents of clearing hospitals.

(*e*) Ambulance trains.

(*f*) Transport by water, as it is feasible.

(*g*) Rest-stations at entraining, detraining, embarking, and disembarking centres.

(*h*) Transport from rail-bases to general hospital.

(8) The factors affecting the evacuation of sick and wounded :—

(*a*) The roads from the battlefield to the clearing hospitals are numerous, well placed, and metalled.

(*b*) There are suitable locations for, and means of improvising clearing hospitals.

(*c*) Two lines of rail are available for the evacuation of sick and wounded from the clearing hospitals to general hospitals.

(*d*) Water transport is available from one clearing hospital to EDINBURGH.

(*e*) The climatic conditions are unfavourable, and sick should be quickly got under cover.

(*f*) The surrounding inhabitants are friendly.

(*g*) The enemy is a signatory of the Geneva Convention.

(C) DEFINITE PLAN OF MEDICAL ARRANGEMENTS.

(1) The Mounted Brigade Field Ambulance will conform to the movement of its Brigade. Sick and wounded will be despatched to some point on the railway, which should be communicated to Command headquarters, and an ambulance train will be ordered to evacuate them.

(2) The sick and wounded of the Lowland Division will be evacuated to the clearing hospital at ——, and from thence to the general hospitals at GLASGOW.

The A.D.M.S., Lowland Division, will ensure that all sick and wounded are evacuated to the clearing hospital in one day, additional transport being improvised locally for the purpose.

(3) The A.D.M.S., Lowland Division, will detach "C" Section, No. 2 Field Ambulance, for duty with the Lothian Brigade.

(4) The S.M.O., Forth Defences will:—

(*a*) Improvise locally additional transport, so as to bring the transport capabilities of "C" Section, No. 2 Field Ambulance, up to that of a complete field ambulance.

(*b*) Evacuate sick and wounded to the clearing hospital at ——, transport being improvised locally for the purpose. These will be despatched from thence to the general hospital at EDINBURGH.

(5) The A.D.M.S., Lowland Division, will arrange for sufficient ambulance transport being improvised for the divisional mounted troops at ——, sick from which should be despatched by ordinary passenger trains to the general hospital at EDINBURGH.

(6) The Medical Officers in Charge of the Highland and 10th Cyclist Battalions will improvise locally, sufficient ambulance transport for each of their units.

The sick and wounded from the former should be despatched to the clearing hospitals at —— or ——, and from the latter by ordinary train to the general hospital at EDINBURGH.

(7) Arrangements will be made with the Red Cross Society as follows:—

(*a*) At EDINBURGH.

(i) For the fitting-out and personnel for two ambulance trains, each to accommodate 100 lying-down and 200 sitting-up cases.

(ii) An aid-station at rail-base and GRANTON landing-stage.

(iii) Transport for conveying sick and wounded from rail-base and GRANTON to the general hospital.

(*b*) Similar arrangements will be made at GLASGOW.

(*c*) Clearing hospitals to be established at —— and ——, and the necessary personnel provided.

(*d*) A rest-station at the embarking stage at ——.

(*e*) A railway rest-station at ——.

(8) The equivalent of an Advanced Depot of Medical Stores will be improvised at ——, in proximity to the clearing hospital, the personnel being supplied from the latter unit.

(9) The equivalents of Base Depots of Medical Stores will be established at the military hospitals at EDINBURGH and MARYHILL GLASGOW).

United Services Medical Society.

BOOTS.

By Colonel C. H. MELVILLE.
Royal Army Medical Corps.

THE subject on which I have been asked to address the Society this evening is "Boots," and I may preface my remarks by saying that the extent and importance of the subject are in inverse ratio to the length of the title. I will try to reduce the extent to more suitable proportions by limiting myself to a consideration only of military boots, as worn by the infantry of different armies, illustrating my remarks by reference to the examples which we have in the Museum, which form a fairly representative collection. I need hardly remind military medical officers that, though it is possible thus to narrow the extent of the subject, its importance can in no way be minimized.

The first point to be considered is the sole, and this we may look at from the side in respect of its thickness, and from below in respect of its shape. But, as a matter of fact, it is impossible to dissociate these two points of view, since the shape is affected to an important extent by the thickness. The object of the sole is to protect the foot against injury from contact with the ground. In a boot that has to face rough work, under conditions in which repair or renewal are difficult, if not impossible, that is to say in the soldier's boot, the sole must be thick, in fact, very thick. But if the sole is thick then the power of plantar-flexion possessed by the foot is entirely lost, and that of dorsi flexion much reduced. In fact, in a military boot dorsi flexion is only possible to any great extent by moving the foot inside the boot, a movement that may, if repeated, lead to severe blistering or galls. As a result the foot is reduced to the condition of a solid block hinging at the ankle, but deprived of all further responsibility except that of affording a solid support to the leg. The part of the foot most seriously affected by this change is the big toe. In a thin-soled boot, or in a sandal, the "push" of the foot is communicated mainly along this digit, but as the sole thickens the impulse is communicated much more by the whole breadth of the foot at the metatarso-phalangeal junction; the extent to which this is done varies very much in different people. In new, unworn boots, the only portion of the front part

of the sole which actually touches the ground is the centre, and as time goes on the pressure spreads outwards or inwards according to the idiosyncrasy of the wearer and the strength of his ankles. Pressure in front of the metatarso-phalangeal joint is absent even in well-worn boots as long as the man is standing. This is due to the fact that owing to the loss of dorsi flexion of the toes the boot has to be sprung up in front to permit of "heel and toe" walking. The important part of the sole as regards shape is the breadth at the metatarso-phalangeal joint, and here accurate fitting is most important. In front of this, so long as the toes are not crowded, actual shape is comparatively immaterial. The toe which of all suffers most from crowding is the big toe, and therefore in front of the broad part of the sole the inside border should run straight forward for a distance sufficient to accommodate the whole length of the big toe.

The great difficulty in designing a sole which shall be absolutely correct, anatomically, results from the fact that the naked foot is not symmetrical on any axis of its own, but symmetrical as one half of a pair of feet. Directly the foot is covered up this symmetry is lost, and beautiful, undoubtedly, as a perfectly shaped bare foot may be, as long as the general outline is broken by the different lines and indentations with which it is marked, that beauty at once disappears when all the detail is muffled up by a uniform covering of leather. In consequence the general tendency has been to try and make the foot as far as possible symmetrical on its own median axis, by sloping the outer and inner borders of the sole inwards to meet in a point, the breadth of the foot being everywhere reduced as far as was possible consistently with ordinary human endurance.

While this extreme was undoubtedly wrong, it is by no means necessary to go to the other extreme of insisting on a boot sole fashioned in the manner of the one I show on the screen, that issued to certain Ghurka regiments. I cannot see that such a boot possesses any advantage over one in which the sole is rounded off, as for instance in our own infantry boot, and indeed in those generally worn. I cannot help thinking that a good deal of extravagant writing about footgear has resulted from people forgetting that the shod man walks in an entirely different manner from the unshod man, and that the person we have to provide boots for is a lad who for eighteen to nineteen years has been wearing cheap, badly made boots, whose foot to all intents and purposes ends at his metatarso-phalangeal joint line.

As will be seen (fig. 1), the sole of the infantry boot is much the

same in all armies, the Italian alone having absolutely square toes, whilst our own and that of the United States are more pronouncedly asymmetrical than any others.

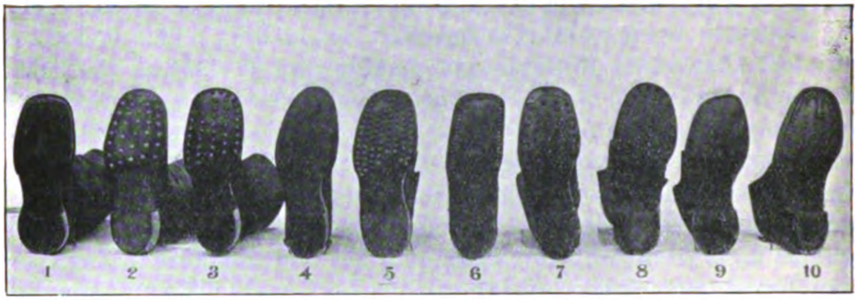

Fig. 1.—Shape of Sole in various Military Boots.

1. Russian.
2. German (new).
3. German (old).
4. American.
5. French.
6. Italian.
7. Japanese.
8. Austrian.
9. Gúrkha.
10. British.

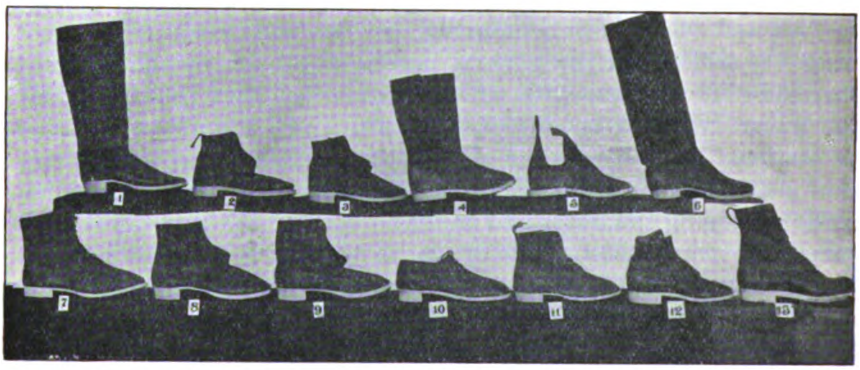

Fig. 2.—Thickness of Sole in various Military Boots.

1. German.
2. British.
3. Gúrkha.
4 and 5. Portugese.
6. Russian.
7. Swedish.
8. Austrian.
9. French.
10. Italian.
11. Japanese.
12. American (new).
13. American (old).

Whilst discussing this question of the plantar aspect of the sole, it is necessary to refer to the use of nails, and other metal accessories. The majority of foreign boots possess large hobnails, which, personally, I consider a great mistake. Sooner or later these get loose, and the resultant hole forms a serious solution in the continuity of the leather, admitting moisture. The comparatively small nails in our boot are quite sufficient to provide a foothold.

The toe-cap of the Japanese boot is also a mistake, not only on this account, but as adding to the weight.

Looking now at the edge of the sole, the plate (fig. 2) shows some of the boots worn in our and foreign armies, with the edge of the sole whitened for the purpose of photography. It will be at once seen that there is a considerable amount of variation as regards the relative thickness of the heel and the forepart of the sole. In our boot this is as 2·3 to 1, whilst in the Austrian and French boots it rises to 3 to 1, in the German 3·5 to 1, and in that of the United States to as much as 3·9 to 1. At the same time the thickness of the instep, which is 1 cm. in our boot, is as low as 0·3 in that of Germany, and nowhere above 0·7, as in the Italian and American boots.

MILITARY MARCHING BOOTS.

	Thickness at heel	Thickness of sole at instep	Thickness of sole under toes.
Great Britain	3·0 cm.	1·0 cm.	1·3 cm.
Germany	3·5 ,,	0·3 ,,	1·0 ,,
France	3·0 ,,	0·4 ,,	1·0 ,,
Austria	3·0 ,,	0·5 ,,	1·0 ,,
Russia	2·0 ,,	0·5 ,,	1·0 ,,
Italy	3·0 ,,	0·7 ,,	1·0 ,,
America (old)	3·0 ,,	0·0 ,,	0·7 ,,
,, (new)	2·7 ,,	0·7 ,,	1·0 ,,
Japan	2·5 ,,	0·5 ,,	1·0 ,,

Centimetre = ·39 inches.

The increased height of the heel naturally throws the centre of gravity forward, and results in the transmission of any shock more directly along the anterior pillar of the arch of the foot, not as it should be, perpendicularly to the tangent of that arch. This effect is aggravated when the instep of the sole is thin, affording relatively less support to the arch. As will be seen in the German boot, this latter dimension is reduced to 0·3 cm., not much more than one-twelfth of the thickness of the heel. It is to this peculiarity that I attribute the occurrence of a peculiar injury called "Fussgeschwulst" in the German Army, an accident which furnished from 20 to 40 per 1,000 of total admissions in the quinquennium 1896 to 1900. The Guards Corps had as many as 943 cases, and the XIIth Corps 1,192. This injury consists in fracture of the heads of one or more of the metatarsal bones, most frequently the second, third and fourth, though some cases are attributed to periostitis, the result of concussion.

It seems most probable that the immediate cause of the acci-

dent is a sudden jar, resulting from the foot coming into contact with some inequality of the road. Tiedemann states that the great majority of cases are the result of overmarching, and Casarini considers that loss of muscular support to the arch of the foot, due to fatigue, is a contributory cause. The injury is most common amongst young soldiers, 339 cases out of 400 recorded in 1898-99 occurring in men in their first year of service. Any peculiarity in the boot which lessens the support afforded to the instep, or which tends to throw the centre of gravity forward, will naturally contribute materially to the occurrence of the injury. It is often brought as a reproach to our boot that it is too unyielding, and that there is not sufficient play in the sole. This, in my opinion, is a positive benefit, as it protects the foot more efficiently from accidental shocks than do the more pliable soles of other nations. As regards the uppers there is not much to say. It is impossible for a tired man to carry a heavy weight over a rough road in an easy, soft boot, such as would be quite suitable for a country walk under ordinary conditions. The new American campaigning boot seems to me to have fallen into this error. It is a retrograde step when compared with the older pattern.

The usual pattern has a large vamp, which forms at the same time the tongue of the boot; in some cases the leather is in one piece, in others, e.g., in the United States boot, a thinner, softer piece of leather is stitched on to form the tongue. As a usual rule the upper edge of the quarter of the boot is just on a level with the lower edge of the malleoli. This seems to me rather low, especially if the boot is to be worn, as it probably will be in the majority of cases, with putties. Personally, when wearing ammunition boots in India I used to have an anklet of leather stitched on to the quarter to give a hold for the puttie. In the old United States boot the boot was much longer and the uppers came much higher up the leg than is the general rule, but in the latest pattern a return has been made to the more usual model; the old boot, in addition, possessed that campaigning impossibility, lace hooks; these now only exist in the barrack pattern boot, but are absent in the campaigning issue. The Russians, Danes, and Germans still adhere to the astounding long boot. The genesis of this pattern is interesting. The natives of Prussia and of the plains of Eastern Europe are accustomed to work in deep mud, and to protect themselves from damp and dirt they are in the habit of wearing high boots with the trousers tucked into them; naturally, after enlistment, they like to adhere to their accustomed boot. Men

from the western provinces of Germany by no means appreciate, I am told, the use of this class of footgear. The German boot was described in *The Times'* account of the German Manœuvres of last year as the worst military boot in Europe, and there can be little doubt that this is true. The heels are too high, the sole is too flimsy, especially at the instep, and the uppers are impossible. Such an article of footgear must inevitably handicap very severely the army whose infantry have to wear it. A sight of it at once takes away any incredulity that might have existed as to the truth of the statement that 30,000 men had to leave the ranks of the German army in the first few weeks of the Franco-German War as the result of foot trouble.

The Russians in Manchuria used to take off their boots in mud and walk barefooted.

The Portuguese boots are rather peculiar. In one pattern the upper leather is continued up the leg to mid-calf. It is slit up the side, the opening being completely closed by a soft piece of leather, and adjustable by means of two straps on the outer side. In the other pattern, which is an ordinary ankle boot, the upper leather is slit at both sides, leaving an opening which corresponds to the elastic side of a "Jemima" boot. This is probably intended to be worn with some kind of gaiter or spat. It has no laces or other means of fastening. The heel is extraordinarily broad, being wider than the fore-part of the sole. The leather used is extremely good and soft in both these boots, though left rough.

The Spaniards are also somewhat peculiar in the matter of footwear. Instead of a boot the soldier wears a low grass shoe or sandal, called an *alpargata;* this resembles somewhat the grass shoe worn by natives in the Himalayas, and is fastened round the instep and ankle by means of thongs. The sole is shapeless and quite flat, without a heel of any kind. This shoe is worn with black cloth gaiters or spats reaching nearly as high as the knee, and fastened at the side by buttons. In addition ammunition boots of the ordinary type are issued, but these are usually carried strapped to the outside of the knapsack.

The Bulgarian troops wear a somewhat similar sandal made of raw hide; these are worn over white woollen bandages reaching as high as the knee, and secured by cross gartering with leather thongs; a somewhat similar custom prevails in Turkey. The regulation boot in the Bulgarian army worn during peace time is almost exactly the same as the long boot worn by the Portuguese infantry.

Camp Shoes.—Light shoes or boots for use in camp, or on the march by footsore men, are carried by the infantry soldier in every army except our own and that of the United States. In the latter case shoes are issued, but are carried in the regimental transport. In Manchuria (fig. 4), during the late war in that country, the Japanese made use of several patterns of native shoe, with grass or leather soles; they also wore a long felt boot, not unlike the Gilgit boot with which men who have served in the north of India are

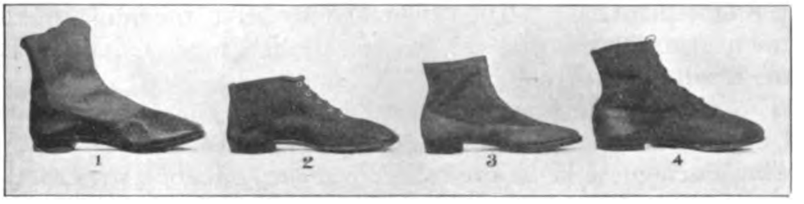

FIG. 3.—Camp Shoes.
1. German (old). 2. German (new). 3. French. 4. Austrian.

FIG. 4.—Japanese Foot Gear.
1. Felt boot. 2. Ordinary marching boot. 3 and 4. Native shoes. 5. Grass boots.

familiar. The fact that this issue is so universally the custom suggests the question whether we are not making a mistake in forming the only exception to the rule. The weight of these shoes is not inconsiderable, from 2 to $2\frac{1}{2}$ lb., in other words, the weight of a substantial reserve ration or of 32 to 40 rounds of ammunition. Personally I should be absolutely against making the soldier carry them, but I am inclined to think that they might conceivably be carried in the regimental transport. Whether this is sufficiently elastic to handle an extra load of about one ton per battalion is another matter; I should hardly think it likely. If it could cope

with such an extra load, then once more ammunition and food would have a prior claim to consideration. It might conceivably be possible to carry a few of the commoner sizes, on, say, a 10 per cent scale, for issue to footsore men.

Spare Boots.—The great Duke of Wellington was once asked, "What was the best requisite that the soldier could be provided with?" replied, "A good pair of shoes"; and when asked, "What the second?" repeated, "A good pair of shoes"; and when again his inquirer said, "What the third?" replied, "A spare set of soles." Spare boots are not now carried by the soldiers of any army as far as I am aware, though in a list of the field kit of our infantry soldier in the first edition of "Parkes's Hygiene" (1864) a pair of boots is included. At the present day it is laid down that this second pair of boots shall be left at the base and presumably forwarded when required. We are here, again, confronted with the question of weight. A pair of ammunition boots weighs 3 lb. 14 oz., equivalent to 62 rounds of ammunition, and very nearly two days' reserve rations. As far as I can see, the first two of the Great Duke's requisites are out of the question. The third might be carried, however, without unduly loading the man. Cobbling in the field is, however, always a difficulty, and the ingenious suggestion published in the Journal about a year ago by Captain Bridges might solve a noticeable difficulty. In this the front part of the sole and the heel consist of two layers, the outer of which is screwed to the inner. The outer layer is grooved, and its welt slides in a channel cut in the inner layer, which is made of prepared leather. New soles can be screwed on when the old ones wear out. At the same time the man has not to discard a well-worn and comfortable upper as he would have to if a new pair of boots, either not previously worn or not worn for some time, had to be used.

The Wearing of Shoes instead of Boots.—The Japanese in Manchuria, up to the Battle of Liaoyang, wore Oxford shoes and gaiters. But the shoes got loose and the gaiters ragged, and the majority of men took to tying on their shoes with a bit of stout string. This kept the shoe close to the foot. Even when boots were introduced after the Battle of the Sha-ho, they were treated in the same way.

The Highland regiments are reported to have suffered on the Mohmand Expedition on account of wearing shoes.

It is difficult to say anything new on so well-worn a subject, but I should like to give a few words of warning, which are applicable to the discussion of all questions where hygiene comes into

contact with custom and fashion, more especially when these are concerned with articles of apparel or food. The actual shape of anything a man wears is the resultant of two forces; on the one hand there is the natural desire to feel comfortable, on the other the equally natural desire to have an appearance more or less like his fellow-men, that is to say, in the fashion. The latter feeling is frequently so strong that comfort is disregarded, and the individual gladly suffers in his effort to become beautiful, or at least to present that appearance which custom at the time considers to be so. On the other hand, we have individuals whose regard for their own comfort or health is so great that they not only entirely disregard all appearances but try to insist that their fellow-men shall do the same. Such people do, in my opinion, much more harm than good; they only succeed in making themselves ridiculous, and as a result we still have people wearing boots which, in the opinion of the faddists, should result in making us a race of cripples, and women wearing clothes which should, if the statements of others of the same class were true, either render them sterile or make what children they did bear distorted abnormalities. And still the ordinary man manages to walk quite satisfactorily, and the race is still on the whole healthy, and its individual members normally constructed. The fact is that the human body is both anatomically and physiologically much more elastic than some people would have us believe. The Mahommedan true believer holds that all infidels have to enter heaven by passing along a path as narrow as a sword blade with very little chance of reaching their goal at the end. Food and dress faddists would have us to believe that the path to health is equally narrow; they try their best to make it equally uncomfortable, and their anticipations of our ultimate success are equally unfavourable. This is quite the reverse of the true case. The road to health is a broad and should be a pleasant path, since one of the conditions most essential to health is comfort. I never yet met either a food or dress faddist who looked comfortable himself, or who succeeded in making his neighbours anything but very much the opposite. The question of footgear has been for years the favourite hunting ground of the faddist, and if the modern boot is irrational and anatomically wrong, it is very largely because self-styled reformers have tried to induce people to wear what I can only term leather coverings for their feet that no man with any respect for his appearance could go about in. It is quite possible to have a boot that neither violates the laws of anatomy, nor is hopelessly at variance with the ordinary custom of the day.

THE STRUCTURE AND FUNCTIONS OF THE FOOT.

BY A. H. TUBBY, M.S.LOND. F.R.C.S.ENG.

Major, Royal Army Medical Corps (T.F.), 4th London General Hospital; Surgeon to Westminster and the Royal National Orthopædic Hospitals.

I deem it an honour to be asked to contribute a few remarks to the subject of this evening's meeting, and I beg to express my thanks to your President, Major E. B. Waggett, for inviting me and to you for your kindness in receiving me. It falls to me to deal with certain elementary facts, and I trust I shall be able to indicate their significance and bearing upon that very important question—the care of the soldier's feet. To turn more particularly to the subject, the structure and functions of the foot.

In general, the foot is usually described as consisting of a longitudinal and a transverse arch. It is better, however, to regard each foot as forming a portion of a dome. The complete dome is seen when the two feet are placed side by side and a plaster cast taken of them in this position. In that case the astragali will form the highest part of the half circle.

The description of the foot as consisting of a longitudinal and transverse arch is inapt, and the term arch is not correct. It cannot be said that the astragalus in any way resembles the key-stone either in structure or function. The action of the astragalus, of its ligaments, and of the muscles which pass over it or under it, is that of a reinforced girder, precisely in the same way as such is used for bridging over the space between the two piers of a canti-lever bridge; although in the case of the foot the piers are not placed vertically, but are oblique. The term "arch" is consecrated however, by long usage, and if its limitations in this connection are understood we may retain it.

The arches of the foot, then, are the longitudinal and transverse. The longitudinal arch is divided into internal and external parts. The internal longitudinal arch is composed of the os calcis, the astragalus, scaphoid, three cuneiform and three inner metatarsal bones. The external longitudinal arch, smaller and shorter than the internal, the span being much nearer the ground, is made up of the os calcis, cuboid and two outer metatarsal bones. They are braced by fasciæ, muscles, tendons and ligaments.

The transverse arches are two; the anterior formed by the heads of the metatarsal bones when the foot is off the ground; and the posterior composed of the astragalus, scaphoid and cuboid. In flat foot the posterior arch yields first, and later on the anterior arch

sinks; this is one of the causes of Morton's disease, metatarsalgia, or anterior metatarsal neuralgia.

The *functions* of the foot are two :—

(1) Passive support in standing ; (2) A lever to raise and propel the body.

FIG. 1.—Tracing of the soles of so-called normal feet. (Bradford and Lovett.)

The Foot in Standing.—If a tracing be taken of the normal foot (fig. 1), it is seen that only a small portion of its surface comes in contact with the ground, namely the heel, the outer border and the balls of the toes. The outer longitudinal arch is, therefore, more solid than the inner, and its elasticity its considerably less. The inner longitudinal arch is so arranged as to provide a series of buffers to break the shock of the impact of the heads of the metatarsal bones and toes on the ground.

In standing, the anterior metatarsal arch is obliterated, and the heads of the second, third, and fourth metatarsal bones come in contact with the ground. The internal border of the foot, which is concave when at rest and off the ground, loses some of its concavity inwards on standing. At the same time the foot in front of the mediotarsal joint undergoes some eversion or abduction. This

in the normal foot is not a definite relaxation of the muscles and ligaments, but is due to rotation downwards and outwards (figs. 2 and 3), of the astragalus on the os calcis until further sinking is prevented by the elastic resistance of the soft structures, particularly of the inferior calcaneo-scaphoid ligaments and the tendon of the tibialis posticus. This, too, is the position of the foot in the *attitude of rest*, and an exaggeration of it constitutes the varying degrees of weak foot and flat foot, or to put it in other words, an abnormally abducted or everted foot is a weak foot, and may become flat.

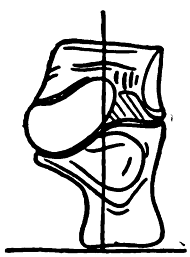

FIG. 2.—The relation of the astragalus to the os calcis. (Whitman.)

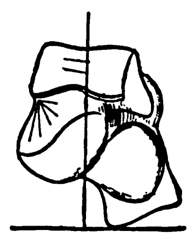

FIG. 3.—The relation of the astragalus and os calcis in flat foot. (Whitman.)

The Foot in Activity.—In planting the feet upon the ground, inasmuch as the outer border is shorter than the inner, the leg is rotated slightly outward and the line of body-weight is directed towards the outer border of the foot, so that it is abducted, whilst at the same time the inner longitudinal arch temporarily sinks. When the foot is advanced the elasticity of the muscles and ligaments comes into play and the eversion disappears. So that when the foot is again placed on the ground it ought not to be everted but should point nearly to the front. That is, when the foot touches the ground, temporary eversion occurs, succeeded by restoration as the foot is raised. So that in walking the attitudes of activity and rest momentarily alternate.

If the patient habitually walks with the feet turned outward, then the attitude of rest or weakness predominates (figs. 4 and 5). Many people hold the foot in an attitude of rest when walking, either because of habit or by reason of bad boots, and do not voluntarily perform that slight movement of the foot inwards so characteristic of the "strong" foot and so essential to perfect progression, and they in time become flat-footed.

The Movements of the Foot and their Physiological Combinations.—The movements are :—

(1) Plantar-flexion or extension.
(2) Dorsiflexion or flexion.
(3) Adduction.
(4) Abduction.
(5) Inversion or supination.
(6) Eversion or pronation.

FIG. 4.—Illustrating the involuntary adduction of the fore-foot, due to the obliquity of the bearing surface of the metatarsus, in the proper attitude for walking. (Whitman).

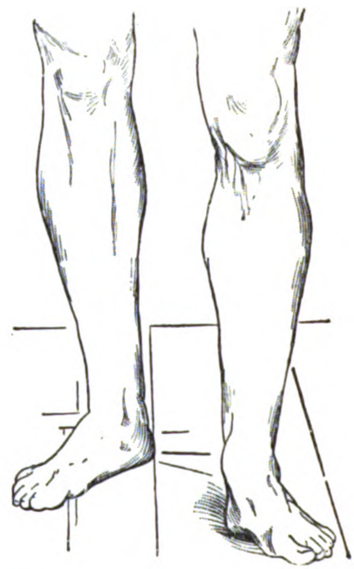

FIG. 5.—The improper attitude of outward rotation, in which there is disuse of the leverage function. (Whitman.)

It can be shown by direct experiment that plantar-flexion is always associated with adduction, and dorsiflexion with abduction. The reasons are twofold: (*a*) The external facet of the astragalus is broader and deeper than the internal, so that when the foot is plantar-flexed the excursion of the external facet of the astragalus on the external malleolus is greater than that of the internal facet on the internal malleolus, that is, the foot rotates inward around the internal malleolus as a centre. On the converse when the foot is fully dorsiflexed, on account of the greater size of the external facet of the astragalus, the foot is more free to swing backward

on the external malleolus, and therefore is twisted outwards. (*b*) Plantar-flexion and adduction, and dorsiflexion and abduction are also combined because the shape of the astragalo-scaphoid joint is such that the anterior part of the foot must move downward and inward in plantar-flexion, and upward and outward in dorsiflexion.

Further, when the foot is adducted, the astragalus glides forward and upward on the os calcis because the calcaneo-astragaloid joint slopes upwards and inwards from the back to the front. The astragalus is therefore raised when the foot is adducted and inverted or supinated; and as the astragalus climbs up the sloping surface of the joint, the arch is increased. In dorsiflexion and abduction the foot is everted and pronated, and the arch sinks, because the astragalus glides downwards and outwards along the inclined plane.

It is clear then that in *both the normal and flat foot adduction is always accompanied by inversion and the longitudinal arch rises;* whilst *abduction is associated with sinking of the arch and eversion.*

Grasping these fundamental points, we are able to appreciate that any cause such as faulty standing, bad walking, and boots which interfere with normal movements cause flat foot and all its attendant evils. There is, however, another important fact to be grasped. In the "strong" walk of a healthy individual or of the savage, the great toe is seen to be adducted when the foot is placed upon the ground. Thereby the great toe supports the anterior pillar of the internal arch and prevents the foot rolling over, as it were, on its inner side.

What then are the causes of foot trouble? Grasping the facts that the positions of activity and strength of the foot are adduction and inversion, and the positions of weakness are abduction and eversion, we realize that walking with the feet turned out, standing with the feet turned out, and bad boots preventing the full physiological movements of the feet, are the essential causes of weakness and disability.

If the feet are turned out in walking as is often seen in a town-bred or weakly man the feet are maintained in the attitude of rest, and this becomes stereotyped until flat foot supervenes. In walking, the feet should be turned nearly to the front and the inner borders should make an angle with the median plane of not more than 25°. This position gives the maximum of strength, agility and poise with the minimum of fatigue, because the major

6

portion of the body-weight falls on to the outer comparatively non-elastic arch. How many men are invalided from armies because of flat feet, and is it not correct that the men are taught to stand with their feet turned out, sometimes at an angle greater than 45°?

Standing with the feet turned out is more provocative of flat feet than walking, because in the former position the feet are not alternately rested as in walking.

Bad Boots.—The faults usually found in boots are :—

(*a*) They are too narrow across the toes and the front part of the foot is cramped, so that its physiological movements are suppressed and the great toe is squeezed laterally outwards; and it is unable to carry out the physiological movement of adduction so essential to the maintenance of the internal longitudinal arch. Boots too small cause blisters, corns and bunions.

(*b*) The heels are too high and the toes are driven forward into too narrow a space and they are cramped; too much weight falls on the heads of the metatarsal bones, the anterior metatarsal arch is depressed and corns form beneath the heads of the metatarsal bones.

(*c*) The support in the waist of the boot is insufficient, and the result is that the arch of the cramped foot already beginning to sink is left unsupported and drops further.

(*d*) The soles of the boot are too thin, and a "rocker" action from side to side and from front to back is established. Owing to the former the anterior metatarsal arch sinks into the concavity and becomes permanently convex. Hence the onset of Morton's disease of metatarsalgia. Owing to the "rocker" action from before backwards the toes are no longer capable of complete flexion and become contracted, in fact they are permanently extended, and the front part of the foot being extended becomes abducted.

(*e*) The depth of the upper of the boot over the great toe is too little and therefore this digit has no freedom. It cannot be flexed when the foot is lifted from the ground and the toe cannot be brought straight to the front as its under part has no free action in the boot; the toe becomes permanently dorsiflexed and abducted and a bunion forms.

(*f*) Boots are often too short. This gives rise to a combination of every ill result.

(*g*) The inner border of the sole of the boot is convex instead of straight or slightly concave. This is totally wrong because the front part of the foot is abducted and held so permanently.

Further, all possibility of assuming the position of adduction, or the position of strength, when the foot is raised off the ground, so essential to its activity is lost. Boots must be so shaped as to assist adduction and prevent abduction of the foot.

There are three points in a boot at which adduction can be facilitated by contact. These are at the heel, on the outer side at the base of the fifth metatarsal bone and on the inner side of the medio-tarsal joint. Therefore, the outer border of the boot should be convex and the inner border of the boot concave; that is, the front part of the boot must have a distinct inward twist, and the width of the sole should be a little more than the foot, when the whole weight of the body is thrown on it. To put it briefly, the sole of the boot should be sufficiently wide and the angle of the lateral inward deflection of the boot should be the same as that of the normal strong physiologically healthy foot.

In civil life it is quite easy and often necessary to assist the feet when they show signs of eversion and weakness, and thus to anticipate flat foot. If what is designated a valgus wedge is put on the boot trouble is averted, and for those whose occupations entail long standing, such as nurses, I frequently advocate this simple measure. A valgus wedge is nothing more than a thickening of one-eighth of an inch on the inner border of the sole and heel, so applied as to make that border one-eighth of an inch thicker than the outer border of the sole and heel.

DISCUSSION.

Lieutenant-Colonel Cottell, R.A.M.C., considered that the great difficulty we all experienced was that the bootmakers measured the foot and then produced a last, but unfortunately the last never had the shape of the foot.

Colonel Bedford said he remembered that in 1898 the question of the soldier's boot was taken up by the War Office, and he believed that was the first time any special attention was paid to this subject, and as a result that admirable pamphlet by the late Major Hughes was published. He asked Mr. Tubby to kindly give his opinion as to the advisability of a boot having a pliable waist.

The President considered that as in walking very little weight came on the inner side of the foot, he saw no reason why the sole on that side should not be bevelled off. He asked if there was any pressure or any inconvenience from pressure on the malleoli from the boots at present in use.

Colonel Melville in replying said that the Japanese were now bevelling off the inner edge of the soles of their boots, and that he had suffered from pressure on the malleoli when wearing the soldier's boots, but that he found that it was overcome by adding 2 or 3 in. of soft leather to the uppers. He asked Mr. Tubby at what angle he considered the feet of soldiers should be placed, when they are standing "at attention." The present angle in the army is 45°.

Mr. Tubby replying said that for hard work a strong non-pliable waist should be used, and he was in favour of nails as they assisted in preventing concussion of the feet. He considered that 30° should be the angle the feet should be placed at when standing "at attention." Any tendency to weak ankles should be treated by thickening the inner side of soles and heels of boots.

Clinical and other Notes.

OBSERVATIONS ON PIGNET'S FACTOR.[1]

By Captain J. A. BALCK.

PIGNET's factor may be briefly described as an index of physical efficiency. It is arrived at by the following formula :—

$$F = H - (C + W).$$

In this F represents the factor, H a man's height in centimetres, C his chest measurement at maximum expiration, also in centimetres, and W his weight in kilogrammes. The larger the excess of H over C + W, or in other words the larger the factor, the poorer the man's physique. In rare cases C + W may be larger than H and then F becomes negative. This only occurs in exceptionally powerful men.

About a year ago Colonel Melville wrote to me suggesting investigations as to the result of physical training on the factor F. I was unable to take it up at the time, but in February, 1911, I began collecting results for this purpose, and have carried them on uninterruptedly since. Captain J. A. Turnbull very kindly collaborated with me by carrying on simultaneous observations at the Depot at Ayr.

Pignet when determining his formula added to it a scale for classifying men according to the size of their factor. This classification was as follows :—

Factor less than 10	Very strong.
10—15	Strong.
15—20	Good.
20—25	Medium.
25—30	Weak.
30—35	Very weak.
Over 35	Useless for military purposes.

My first endeavour was to classify the men under these headings when they came under my charge at the gymnasium at the Curragh. Comparatively few of them came to me immediately after enlistment, most had two or three months' service, and a large number had been in the Special Reserve. The factors of 344 men were as follows :—

Less than 10 (very strong) per cent	10—15 (strong) per cent	15—20 (good) per cent	20—25 (medium) per cent	25—30 (weak) per cent	30—35 (very weak) per cent	Over 35 (useless) per cent
1·4	3·7	6·6	19·4	25·6	23·9	19·4

It will be seen that no less than 69 per cent of these men belong to the weak classes, and that just under $\frac{1}{5}$ of the whole are according to

[1] Received for publication December 20, 1911.

Pignet militarily useless. It must be remembered that these men are not absolutely raw recruits.[1]

My next figures represent the factors of the same 344 men at the completion of their course of physical training, and are at least two, if not more months, later than the earlier ones. There is considerable improvement :—

Less than 10 (very strong) per cent	10—15 (strong) per cent	15—20 (good) per cent	20—25 (medium) per cent	25—30 (weak) per cent	30—35 (very weak) per cent	Over 35 (useless) per cent
1·7	2·6	13·3	23·9	22·0	26·1	10·4

There is, it will be noticed, a marked shifting of numbers to the left, *i.e.*, to the stronger classes. Withal there are still 58·5 per cent of the men in the weaker classes, and 10 per cent among the "useless."

Inevitably, with a scale so obviously out of harmony with our recruits, the next step is to consider whether it is the scale itself which is at fault, or the material from which we draw our Army. An application of the scale to another Army will throw some light on this, and through the kindness of Colonel Melville and Major Pollock I am able to give some recent German figures. For 859 men[2] passed fit this year at the Musterung (preliminary examination of recruits), in the Gumbinnen District of East Prussia, the apportionment is :—

Less than 10 per cent	10—20 per cent	21—30 per cent	31—35 per cent	Over 35 per cent
47 = 5·4	338 = 39·3	446 = 51·9	26 = 3	2 = 0·23

9,986 men reached the military age this year in the Grand Duchy of Baden,[3] 201 were put back as being under height (below 154 cm.). The remaining 9,779 were distributed among the various classes as follows :—

Under 10 per cent	11—20 per cent	21—30 per cent	31—35 per cent	Over 35 per cent
4·7	28·0	45·6	13·6	8·1

For Bavarians[3] passed fit for service with the colours the figures are :—

Under 10 per cent	11—20 per cent	21—30 per cent	31—35 per cent	Over 35 per cent
7·85	40·5	49·5	1·77	0·29

It is impossible to resist the conclusion that the scale which was originally devised in the French Army very fairly meets the case, as also in the German Army. We are driven to the admission that its inapplicability to our own service is due to the stamp of recruit we are getting. It should

[1] The figures Captain Turnbull gives for 41 raw recruits are : 10 — 15 = 9·7 per cent; 20 — 25 = 7·3 per cent; 25 — 30 = 17 per cent; 30 — 35 = 22 per cent; over 35 = 44 per cent; or a total of 83 per cent belonging to the weak classes.

[2] Seyffarth, "Beitrag zur Verwertbarkeit des Pignetschen Verfahrens," *Deutsche Militärarztliche Zeitschrift*, November, 1911.

[3] *Der Militärarzt*, November 22, 1911.

be remembered, however, in our favour, that the average age of our recruits is only 18 as compared with the continental 20. This age is also, as is only too well known to all of us, in many cases only a nominal 18. I remember a case of a boy who after three months' service admitted he was only 15. A fairer comparison would be one of the Continental recruits with the British soldier of two years' service, as he is found in India or the Colonies. It would be interesting to see the result of measurements taken there.

Are we then to conclude that Pignet's scale is of no use to the British medical officer? By no means; I myself employ it constantly as an index of physical efficiency and would recommend it to all who are in charge of gymnasia. For practical purposes I have lowered the standard by 5 points, making 40 my limit of the useful soldier. With this modification it is an invaluable aid in gauging a man's progress, and arriving at a decision as to his fitness to be dismissed gymnasium.

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NOTES ON THE VENTILATION OF TROOPSHIPS IN THE TROPICS.

By Major C. F. WANHILL.
Royal Army Medical Corps.

The following remarks are based on experience gained on the "Rewa," and are not intended in a captious spirit, or to indicate that the ventilation of that ship is not good, but to suggest improvements which might be embodied when a fresh ship is hired.

Taking first the troop decks, these are ventilated by forced draught in the following ways: (*a*) By wind scoops in the ports when they can be opened. (*b*) By wind sails. (*c*) By blowers, worked by electric fans. There is also a system of extraction of air by fans in the engine room.

This system works well in as far as the actual ventilation of the decks is concerned, if ventilation in the tropics is considered to consist in the removal of the products of respiration and of evaporation from the skin only, but in my opinion this is not all that is required in the tropics. To ensure comfort it is also necessary to have currents of air which, impinging on the body maintain it at a comfortable temperature. In the vast spaces of the troop decks this is almost impossible, as the force of the wind is lost or is not apparent at a short distance from the source. It is also not necessary since most of the troops prefer to sleep on deck.

In the hospital and in the cabins, however, this system breaks down, since with the ports closed, as they have to be occasionally, there is no source of draught. The extraction of the air from each cabin certainly keeps the air from becoming foul, but the process is very gradual and no

perceptible draught is induced; while the air to replace that being withdrawn comes from passages, &c., where it is certainly not fresh. The fact that fans have to be installed in each cabin is a confession of the failure of the ventilation. If there is a head wind then the wind scoops can be trusted to secure the necessary movement of air, but it is not always possible to use them. In the hospital it is often impossible, and the electric fans which are installed lose their effect at a distance of about six feet, while the blower with which the hospital is fitted is turned to the bulkhead, and most of the air delivered is lost up the troop deck, and no draught is perceptible. With two wind sails in the hatch a good draught is maintained near the latter, but the effect is soon lost, and with a following wind it is of course nil. The direction of the draught also completely nullifies the effect of the electric blower, by forcing the air up the troop decks. It is suggested that, if the small fans were done away with and another blower established on the other side of the hospital, while both were made so that they could be turned round to the required position with or without a dispersion cone, the effect would be to increase the comfort of patients in bed, and of the hospital attendants. In the "Rewa" the cutting off of most of the ports on the port side by the women's quarters is a pity, as this prevents a cross draught when the ports can be used.

In the cabins, if the present exhaust system could be converted into a blower, one of the fans could be dispensed with at a considerable saving, besides getting rid of the noise attendant on their use. Air forced into the cabins could be trusted to find its way out without the intervention of an exhaust system, while the expense of installing the former should not exceed that of the latter, especially where forced draught is already used for the boilers. This air would necessarily be fresh, and could be regulated with a simple slide under control of the cabin occupants.

Another objection to the exhaust system is that when there is very little wind, or when the ship is going as fast as the wind, the foul and offensive air from the troop decks is sucked into the upper portions of the ship. With a plenary system, if the intake was carefully placed, this would be impossible. The air would not also have to be forced through the ship from one end to the other as when the wind sails are in use, but would escape upwards from every opening.

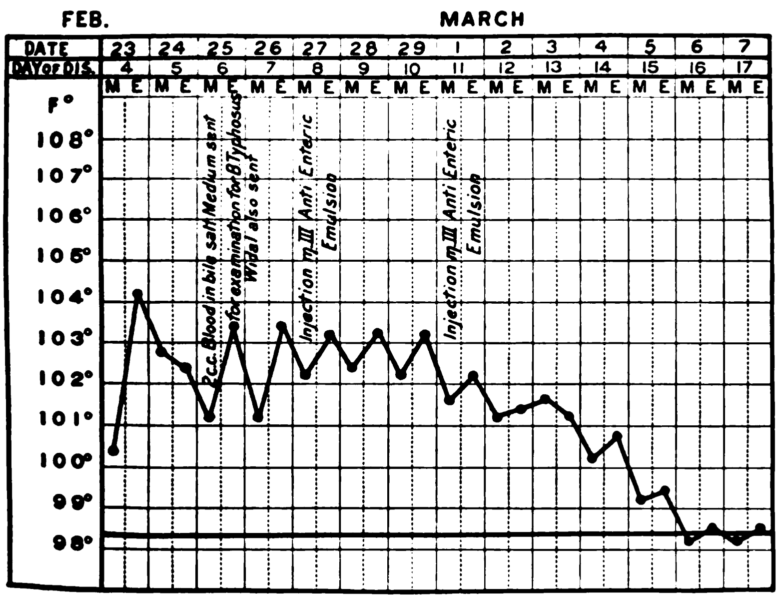
There are undoubtedly technical difficulties in the way, but it seems probable that these could be overcome with a little ingenuity.

TWO CASES OF ENTERIC FEVER TREATED BY ANTI-TYPHOID VACCINE.

By Lieutenant-Colonel H. CARR and Captain H. D. C. MACARTHUR,
Royal Army Medical Corps.

The cases occurred in Ambala in February, 1912.

Case 1.—Lance-Corporal T. was admitted to hospital on February 23. He had been ill for a few days previously, and on admission had all the typical symptoms of enteric fever; headache, diarrhœa, rose-coloured spots, &c. A blood culture was taken from which *B. typhosus* was isolated. The patient was placed on a fluid diet and sponged every four hours; under this treatment the diarrhœa gradually subsided, but his general condition became worse. He was exceedingly lethargic, slept badly and continued to suffer from severe headache.



Lieutenant-Colonel Carr, R.A.M.C., suggested that treatment by anti-enteric emulsion should be tried. The patient was given his first injection on February 27, which was the eighth day of the disease. Three minims of the ordinary prophylactic emulsion were injected. This produced no appreciable effect on the temperature or amount of urine excreted, but next day the patient said that it had done him a lot of good and that his head felt clearer, and he certainly looked brighter and less drowsy the next morning.

On March 1 another injection was given, the same amount of emulsion was again used, and this appeared to have a beneficial result. The patient's temperature rose about a degree after the inoculation, and from that time gradually came down by lysis until March 7, when it reached the normal line, where it has since remained. There was a marked improvement in his general condition, the headache disappeared, his mind became clearer and he slept well at night.

As the temperature reached normal on the fourteenth day of the disease, and taking into consideration the severity of the case before that time, one seems to be justified in concluding that the inoculation saved him several days of continuous fever.

One of the most marked features of the case was the rash, which was very intense, traces of which were present on the arms and legs, as well as on the chest and abdomen.

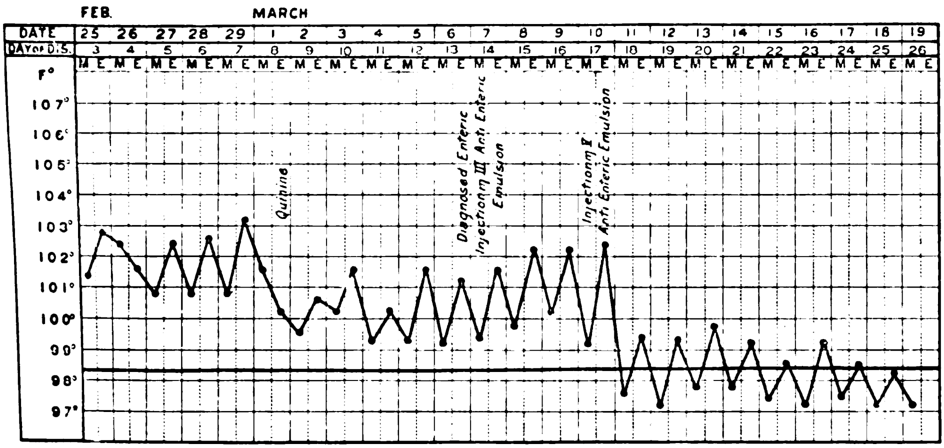
The second case occurred about the same time, the history being as follows:—

The patient was a staff-serjeant of the West Riding Regiment, aged 29. He began to feel ill on February 24, was detained at a section hospital on the 25th, and moved to the Station Hospital the next day. On admission the patient's temperature was 102·4, pulse 90. He complained of severe frontal headache, his tongue was slightly furred and he was inclined to be constipated. There were no spots on his abdomen. The spleen was slightly enlarged. Heart, lungs and urine were normal. No malaria parasites were found in the blood, the differential blood count was:—

Polymorphonuclears	62 per cent.
Large mononuclears	20 ,,
Lymphocytes	16 ,,
Eosinophiles	2 ,,

Widal's reaction and blood culture gave negative results. For the first few days the case did not look like one of enteric fever. The temperature was of a rather swinging type and the patient had one or two attacks of shivering, which were thought to be ague, but, unfortunately, these attacks occurred when there was only an orderly present. Quinine was given, and it first appeared as if it were going to check the fever, but this hope was not fulfilled. The motions were soft and frequent, but were not the typically enteric stools of the other case. His only complaint was of headache, which was severe. As the fever did not yield to quinine a specimen of blood was, in the absence of the Brigade Bacteriologist, sent to Naini Tal. Captain Wood, who examined it, wired on March 6th that *B. typhosus* had been isolated. On the next day ♏iii anti-enteric emulsion were injected. This had no effect on the temperature chart or on the amount of urine excreted, but, as in the last case, the patient was quite convinced that the injection had done him good and from that time his headache began to subside. On the morning of

March 10, ♏v were injected. The result of this second injection was most striking. The patient's temperature on the following morning fell to 97·6, and although for the next few days the evening temperature was slightly above the normal line, it never reached anything like the height it had been before the inoculation.



The most striking result, however, was the increase in the amount of urine excreted. Before inoculation it had averaged about 16 oz. in the twenty-four hours. On the day of the inoculation it was 45 oz., and this increased amount has been maintained throughout the disease. The patient's general condition improved greatly, his headache completely disappeared and he began to have good nights instead of the restless and often almost sleepless nights he had previously experienced.

Although in this case the actual duration of fever could not perhaps be said to have been very materially lessened, yet the improvement in the patient's general condition seems to have justified the use of the vaccine, and the increased amount of urine excreted was a convincing sign of the therapeutic value of the procedure. One point which suggests itself is that if a soldier believes that he has been cured by inoculation he will probably have a considerable influence in convincing his comrades of the value of the prophylactic use of the vaccine. Neither of these patients had been previously inoculated.

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BIER'S HYPERÆMIC TREATMENT IN GONORRHŒAL EPIDIDYMITIS.

By Lieutenant L. F. K. WAY.
Royal Army Medical Corps.

Having been much struck by the good results obtained with this method in a series of cases of gonorrhœal epididymitis, I think that they may prove of interest to others.

I am the more inclined to publish these cases as Mr. H. F. Waterhouse, who has had a very large experience with Bier's treatment, in an address recently delivered on the subject,[1] is by no means enthusiastic over the benefit to be derived from it in cases of gonorrhœal epididymitis. His words are as follows :—

"Many instances of tubercular and gonorrhœal epididymitis have been benefited, but in general the results have not been striking."

My cases are sixteen in number, and have been taken just as they came, without any selection; in every case the improvement was rapid, and I am of opinion that the results have merited the epithet "striking."

Application of Treatment.—The treatment of the cases was as follows: On admission to hospital the patient was put to bed and given a brisk purge. The urethra was syringed out twice a day with a weak solution of potassium permanganate, after which the patient was told to pass his urine to wash out the posterior urethra. Urotropine (gr. x) was given twice a day well diluted with water; when micturition was painful, tincture of hyoscyamus was added.

The local treatment was carried out by taking a piece of ordinary irrigation rubber tubing, ¼-in. in diameter, and applying it round the scrotum above the affected testicle and fastening it by means of a pair of Diffenbach's artery clips; when there was any difficulty in applying the tubing to a single testicle, both testicles were included. There is no necessity to put lint or any other protection under the tubing. A small pillow or other support was placed under the scrotum to keep the testicles somewhat raised.

The great essential of the hyperæmic treatment is that it must not cause pain. In only one of my cases was the pain not relieved almost at once; the tubing was obviously too tight, and on slackening it a little, relief was soon obtained.

Special care must be taken that the tubing is not too tight, because in the case of the scrotum changes in the colour of the skin are less obvious than elsewhere, and also there is no distal pulse to be felt; so that reliance must be mainly placed on the absence of pain.

In my cases the tubing was kept on as a rule for twelve hours per

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[1] An Inaugural Address, *Brit. Med. Journ.*, December 16, 1911.

day with an hour's interval in the middle of the day, but in some cases for an hour or two longer.

Results and Conclusions.—In all cases the pain was promptly relieved, and the patients uniformly expressed themselves much benefited.

The period elapsing between the probable date of infection and admission to hospital varied from five days to three months, but this did not bear any relation to the length of treatment necessary to obtain relief from all symptoms.

The number of days between the commencement of the treatment and the disappearance of all pain and tenderness varied from five to fourteen days, average about nine days, some painless thickening, of course, persisting.

The conclusions I have drawn from these cases are, that if Bier's treatment is applied in the early stages of gonorrhœal epididymitis, the inflammatory process in most cases is arrested, as illustrated by cases 1 and 4 (left testis); that in a well-established case the pain is at once relieved, so that a very painful affection is converted into a nearly painless one, and that an ultimate cure is effected very much more rapidly than by any other method of treatment.

Lastly, the treatment is quite clean, as the necessity for the use of guaiacol vaseline, Scott's dressing, puncture of a vein, leeches, &c., is avoided.

Case 1.—Patient admitted October 10, 1911. He had a urethral discharge, his right testis was painful and his right epididymis a little enlarged; treatment was begun on the day of admission, all acute symptoms had disappeared by October 14; in this case strapping was applied for a few days after the tubing had been taken off.

Case 2.—Discharge present, left epididymitis developed while under treatment in hospital on October 8, 1911; recovery had taken place by October 22.

Case 3.—This patient had gonorrhœa for a month before admission, and his left testis had been enlarged for some days; treatment began October 8, 1911, recovery of testis October 16. He had some discharge when the epididymitis came on.

Case 4.—Profuse discharge on admission, the right testis was painful and enlarged and had been so for two days; treatment was begun on October 12, 1911, recovered October 21. On November 6, the left epididymis became slightly involved; hyperæmic treatment was started at once, and recovery took place by November 10.

Case 5.—The testis had been enlarged for eight days before admission, when the inflammation became very acute. He responded very well to treatment, which was begun on October 16, 1911, and ceased on October 23, only some thickening remaining.

Case 6.—Had a slight discharge on admission, the left testis was

enlarged and very painful; the cord was very painful in the groin; hyperæmic treatment was begun October 28, 1911; recovery November 9. The pain in this case was not much relieved in the upper part of the cord, though the testis responded well. This man was having prostatic massage; two or three days after this had been begun he developed epididymitis.

Case 7.—The patient had contracted gonorrhœa about August 25, 1911; he had been under treatment some time before he came under my care, November 14—at this time both knees and the left ankle were swollen and painful; on November 15, his left testis became painful and swollen; Bier's treatment was begun at once and recovery took place November 23. Martin's bandages were put on for the joint conditions and gonorrhœal vaccine injected; he made an uninterrupted and quick recovery.

Case 8.—Admitted with a slight discharge; treatment begun December 16, 1911; recovery December 24.

Case 9.—Patient had no discharge on admission; treatment begun December 15, 1911; recovery December 23.

Case 10.—Patient had had no discharge for some days; epididymitis had existed for five days on the right side; treatment begun on January 6, 1912; recovery by January 11.

Case 11.—Patient admitted January 17, 1912; with left epididymitis and a slight cloud in urine; by January 25, the testis was almost of normal size and there had been no pain for three days.

Case 12.—Patient admitted January 6, 1912; with no discharge; right epididymitis. Hyperæmic treatment was begun at once; recovery on January 1. Discharged from hospital a week later.

Case 13.—Patient while under treatment for gonorrhœa, developed right epididymitis on February 3, 1912; hyperæmia treatment was begun at once; recovery February 11.

Case 14.—Patient admitted with left epididymitis and slight discharge, February 2, 1912; hyperæmic treatment was begun at once; improvement went on till February 7, 1912, when he had frequent vomiting and diarrhœa, and a temperature of 103° F. for two or three days; the testis did not improve during this time, but when these symptoms abated the testis improved quickly and was nearly the normal size on February 12.

Case 15.—Patient admitted with very painful right epididymitis on February 3, 1912; the testis was enormously enlarged; the usual treatment was begun at once, recovery on February 13.

Case 16.—Admitted with left epididymitis and slight discharge on February 17, 1912; recovery February 24.

I am indebted to Lieutenant-Colonel T. E. Noding for permission to publish these cases.

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A CASE OF *BACILLUS COLI* INFECTION OF THE KIDNEY COMPLICATING PREGNANCY TREATED BY ANTI-COLI SERUM.

By Captain S. E. LEWIS.
Royal Army Medical Corps.

Mrs. P., wife of a Corporal in the R.M.L.I., six months pregnant, was admitted to the Military Families Hospital, Devonport, on January 1, 1912, as a possible case of appendicitis. On admission, the patient complained of severe pain in the right loin, vomiting, shivering, and profuse sweating of nine days' duration. The onset was mild, but after two days the pain became very severe, and she was often "doubled up in agony."

There was a history of increased frequency of micturition for the past fortnight, as well as during the early months of pregnancy, but the patient did not notice any change in the colour or amount of her urine.

January 1, 1912.—On examination the patient looked very ill and emaciated. Temperature 102·6° F., pulse 112, respiration 20.

The bowels had not acted for two days, and the tongue was dry and coated. With the exception that the heart's action was rapid nothing abnormal was discovered from examination of the chest. The fundus was at the upper border of the umbilicus, and the uterus had the usual right lateral obliquity. The abdomen moved freely with respiration, there was no rigidity whatsoever, and the only place where the patient complained of pain on pressure, was behind in the right lumbar region. No mass or tumour could be felt by abdominal or vaginal examination. The fœtal heart could be well heard. The urine was scanty in amount, very acid, sp. g. 1026, and contained a moderate amount of albumin, but no blood or pus.

Treatment.—The patient was ordered a milk diet, hot fomentations to the affected loin, and an enema.

January 2, 1912.—The patient had a fairly good night, slept five hours. The enema yesterday was returned unchanged, so castor-oil was given last night, and the bowels have acted twice. Temperature at 6 p.m. yesterday was 103·8° F., and at 2 a.m. this morning it was 105° F. Pulse regular, 132, respirations 24.

She stated the pain in her side was not so acute to-day. A mixture containing urotropin, potassium acetate, and potassium citrate was ordered every four hours.

The patient was seen in consultation to-day. We came to the conclusion that the case might be one of *B. coli* infection of the kidney, and that treatment with anti-coli serum should be started.

A catheter specimen of urine was sent to-day to the laboratory for bacteriological examination.

January 4, 1912.—The patient had a rigor at 1 a.m., lasting five minutes. The temperature rose to 104·4° F., and she vomited several times.

The temperature this morning was 103·2° F., the pulse 130.

The bowels were very constipated, and she was only passing about 20 ozs. of urine in twenty-four hours, it was acid and contained albumin. The fœtus was alive, fœtal movements could be seen and felt.

A slight colourless discharge without any odour appeared from the vagina. Vaginal examination showed nothing abnormal.

The report of the bacteriological examination of the urine was received to-day from Major Packer, stating that it contained a pure culture of *B. coli;* therefore 25 c.c. anti-coli serum was injected subcutaneously. The patient was also ordered calcium lactate gr.x, t.i.d., to prevent joint pains, rashes, &c., and she was put on sanatogen.

January 5, 1912.—The temperature rose to 104·2° F. an hour after the injection yesterday, this morning it was 102·8° F., pulse 116.

The patient now stated she felt better; the vomiting had ceased and the pain was much less; 25 c.c. anti-coli serum were again injected.

January 6, 1912.—Temperature this morning was 97·2° F.; last night it was 102·8° F., pulse 108, weak. Patient vomited several times again last night. She was ordered tinct. opii. ♏x this morning, champagne 1 oz. every two hours, and nutrient enemata.

January 7, 1912.—The vomiting has ceased since the opium yesterday; pulse has improved, being this morning 102, regular and strong, and she slept nearly all night. She is now free from pain; 41 oz. urine were passed in the last twenty-four hours; it was still acid and contained a trace of albumin. The alkaline mixture was discontinued as well as the nutrient enemata. The vaginal discharge has ceased.

The temperature this morning was 101° F.; 25 c.c. anti-coli serum were injected subcutaneously.

From this date to the evening of the 14th, the patient's temperature and pulse remained normal and a steady improvement was made.

On the evening of the 14th, the temperature rose to 103° F., pulse 110, and so 25 c.c. anti-coli serum were injected.

This amount of serum was again injected subcutaneously on the 22nd and 27th, as the temperature began to rise.

Her temperature and pulse were again normal on February 1, and remained so, except for occasional slight rises.

She was allowed up on February 20. On March 31 a fine healthy boy, weighing 7¾ lb., was born in the hospital.

Remarks.—It is somewhat extraordinary that a miscarriage did not occur, inasmuch as her temperature was once 105° F., and frequently over 104° F.

The pain and tenderness were entirely limited to the area of the right kidney; it is therefore probable that the left kidney was not affected, and this can possibly be explained by the inclination of the uterus to the right, the pressure on the right ureter interfering with its functions, and so assisting infection by *B. coli.*

AN UNUSUAL CASE OF SPONDYLITIS.

By Major DAVID M. GREIG.

Royal Army Medical Corps (T.F.).

C. R., aged 21, formerly Trooper No. 2005 3rd Dragoon Guards, was referred to me by Dr. Kerr on September 30 of last year, complaining of pain in the right hip and knee of thirteen months' duration. He had an excellent family history. He is the fourth of twelve of whom two died in infancy, the others and parents are well. His personal history has been unexceptionable. At 16 he was apprenticed as a blacksmith and worked at that trade for two years. He then enlisted in the 3rd Dragoon Guards and was quite well and fit for duty till August, 1910, when he was on manœuvres on Salisbury Plain. It was a very wet season and he thinks the exposure and the cold started the present trouble. It began, he says, with a cold in the chest and a continued cough which existed during six months. The hip gave no trouble then. He was never in hospital, but carried on a modification of his usual duties. About February, 1911, he began to have pain in the right hip when he coughed and this pain passed down the back of the thigh to the knee. It must have been of great severity because he had often to kneel down when he coughed on account of this pain; indeed he was not able to stand erect, and the kneeling with the thigh in flexion evidently gave him relief. Though he was never in hospital he was discharged as medically unfit for further service on July 24. He returned home and worked in a boatyard until August. During July, August, and September, 1911, he had no cough and that source of trouble has not returned; he also said the pain was somewhat less acute and not constant. I found him to be a strong, well-built lad, a type of what a soldier ought to be, deep-chested and powerful—a man to whom fatigue comes only late in life. There was apparently, some atrophy of the muscles of the right thigh and calf. He indicated the site of pain as over the right sacro-iliac articulation. In recumbency, with the exception of slight restriction in hyper-extension, the movement at the right hip and at the knee was normal. Standing erect there was a very slight dextro-concave lumbar scoliosis enormously increased on flexion. There was much stiffness about the movements of the spine, and when he bent forward the spine twisted into a marked dextro-concave scoliosis, which was regular throughout and involved the whole spine, though most marked in the dorso-lumbar region. He was not able for much exertion and walked with a slight limp, apparently from the spinal condition. When standing at attention for any length of time he had increasing pain in the right sacro-iliac region, for the relief of which he had either to flex the body on the thigh or the thigh on the body. This pain ran along the antero-external aspect of the thigh, and, as he expressed it "lands in front of the knee on the knee-cap." From the first and subsequent examinations it seemed clear that the trouble

was located in the lumbar spine, with perhaps involvement of the lower two or three dorsal vertebræ. This region was absolutely stiff and stood neither extension, flexion nor rotation. The right side was apparently the one at fault, for, on bending forwards, the spine became twisted, allowing apparently of some separation of the left sides of the affected vertebræ, while the right sides remained fixed. He was kept in hospital for observation during a short time and had a variety of anti-rheumatic treatment, apparently with some little benefit. A couple of months later he had a pretty free though light application of the actual cautery all over the right loin, and this was followed by very great improvement. Indeed, so much so that it was repeated about three months later, and again a marked improvement followed. It is now six months since I saw him first, and though there is still some stiffness in the lumbar spine the scoliosis produced on flexion is very much less, all pain has practically gone, and the lad has, to all intents and purposes, recovered.

The condition was a puzzling one and its onset peculiar. Indeed, it is probable that the cough had nothing to do with the spinal condition but was merely an accidental complication. The condition which developed in the spine could not, I think, have been accurately diagnosed until it had existed some time, indeed, until the fact of its clearing up under special treatment helped one out of the difficulty. The various conditions which might lead to stiffness of the lumbar spine must have crossed the minds of those who had given the case due consideration. Tubercle, osteo-arthritis, ossification of ligaments or fibrous myositis, a spondylitis of gonococcic origin, or that curious condition, spondylose rhizomélique. We must put aside at once gonococcic origin. There was no history that could support this, and, indeed, in some of these obscure cases of spinal stiffness the assumption that gonorrhœa, though denied, had existed, is unwarrantable. Osteo-arthritis of the spine follows, precedes, or occurs in conjunction with affections in other joints, but in the case under consideration nothing of the kind existed. Tuberculous osteitis must certainly have been thought of by each medical officer who examined him, but the pain was much too severe and the deformity of the spine, which one would expect would have rapidly supervened in such an acute case, was absent. There was never, apparently, any evidence that the cough was due to tuberculous disease of the lungs, and what is more important than all is the fact that the disease made no progress, though the man was always moving about and never laid up in hospital. Stiffening and contraction of the muscles such as accompanies fibrous changes in them, the absolute unimprovable stiffness which is characteristic of ossification of the ligaments were not found in this case.

We are, therefore, reduced to a choice between spondylose rhizomélique and spondylitis of rheumatic origin. One might plead for either. Spondylose rhizomélique occurs, as a rule, in young people, and it is certainly not always possible to point to any definite infection. It is

a slow complaint and is apt to be progressive, spreading over many years. Though in it, from time to time, improvements may occur, I do not gather from the literature of the subject that the prognosis is good. Indeed, it is this fact which gives the best reason for excluding the diagnosis of spondylose rhizomélique. There was no relapsing, there was no temporary improvement, nor while he was under my observation did the condition show any tendency to become generalized. On the contrary, during the six months I had supervision of the case, the patient slowly and steadily improved. The treatment was entirely on the lines of anti-rheumatic treatment, and the counter-irritation, which on the two occasions of its application was followed by such marked benefit, was only the counter-irritation which is known to do good in so many cases where some chronic neuritis exists. The ultimate conclusion, therefore, is that the case is one of spondylitis rheumatica, and that the prognosis is quite satisfactory.

CASE OF TAPEWORM.

By Captain W. E. C. LUNN.
Royal Army Medical Corps.

The following case seems worth recording on account of the unusual length of the worm.

Mrs. B., the wife of a N.C.O., casually mentioned to me one morning that she was passing pieces of worm similar to what she had passed a year previously, when, after a dose of medicine, she had passed a worm about 20 ft. in length.

The patient was a fine healthy woman, of excellent physique and constitution, her only real complaint being the large meals she felt obliged to eat. I prescribed the usual dosage of male fern extract, preceded and followed by castor-oil. The next morning the worm was shown to me in a bucket of water, which it appeared literally to fill. I had the worm, which was in four parts, removed from the bucket, laid out and measured; to my astonishment the total measurement came to 79 ft. 4 in., in places the segments were an inch broad.

The pieces were, as far as I could ascertain, all belonging to the same worm; the head was not recovered.

Lectures.

MOBILIZATION OF FIELD MEDICAL UNITS.
NO. 3.—DUTIES OF R.A.M.C. IN THE FIELD.

Warfare in Uncivilized Countries.

By Lieutenant-Colonel O. R. A. JULIAN, C.M.G.
Royal Army Medical Corps.

The Pathan or hill man of the north-western frontier of India is a fine, tall, muscular individual with a European but slightly Jewish caste of features, and a skin tinted only with brown. He stalks along with an independent air, looking whoever he may meet straight in the face and treats the down-country native with contempt. He is honest, straightforward, brave even to recklessness, but is very vindictive. Feuds between villages or individuals sometimes last for generations. Apparently friendly when they meet away from their homes and among strangers, the participants in a feud will often make long detours on the way home on the chance of getting a pot shot at each other. When he wants to kill an enemy extraordinarily badly his code of honour is to catch that enemy asleep, or steal up behind him and stab him in the back, and if he himself escapes unhurt he is a hero. There is nothing much heard about the prisoners he takes in war, but none appear again, and rumour says it is not at all advisable to be taken prisoner by him. For all this he would feel dreadfully insulted if he were called a savage and would do his level best to wipe the insult out. When young, the excitement of raiding a village appeals to him. In the winter of 1907, after several minor aggressions, a large party collected, chiefly composed of a tribe named the Zakka Khels, entered Peshawar city, overpowered the police, looted the shops in a main street, including a bank, and went off joyfully, loaded with pluuder, before any word of their doings reached cantonments. This brought things to a climax and an expedition was talked about, but took no definite shape until towards the end of January, 1908, when orders to mobilize for manœuvres arrived. In Peshawar there are several field hospitals ready mobilized—that is to say, the ordnance equipment, medical equipment and comfort panniers are in charge of the medical authorities and stored in buildings not far from the hospital. The Supply and Transport Corps provide the vehicles, harness and animals in India, so these field hospitals can be got ready to move in an hour or two. It is only a question of providing sufficient personnel. There are two kinds of hospitals, one called British field hospital and is for treatment of Europeans, the other called Indian or Native field hospital, in which natives are treated. Both these units perform the duties of a field ambulance and are likely to be called so in the near

future. Some are fast moving, others slow moving, the former have mules for their transport, the latter oxen, but present little difference otherwise. The terms "slow" and "very slow" would perhaps be more appropriate.

Bazar Valley Expedition.—Everyone, including natives, seemed to be quite aware what the so-called manœuvres were intended for and displayed considerably more zeal in their preparations than usual. The scale of baggage was 35 lb. for an O.C., 20 lb. for other officers and 10 lb. for men, not a great amount for camping in snow. Pack transport only was to be taken. Mountain batteries were to accompany the two brigades of infantry and a couple of regiments of cavalry, who with a company of sappers and miners and the hospitals constituted the force. The mules are led in strings of three by native drivers. The burdens of the former are hung on the hooks of the pack saddle on either side. At first there is difficulty in putting up the loads, for the army hospital corps natives, who have, of course, to do the work, do not get any practice in peace time. There are no regular transport serjeants available for hospitals, so a bombardier from a battery is sent instead, who has probably only worked with horses. The personnel of the hospital is composed of officers R.A.M.C. or I.M.S., assistant surgeons, nursing orderlies, who are regimental men who have been trained in hospital work, native ward servants, water carriers, cooks, washermen, and sweepers. The means of transporting sick are dhoolies, each carried by six bearers and used for lying-down patients, camel kajawahs—a sort of box in which a man can sit—and riding animals. The field force assembled just outside the Peshawar cantonments on February 12 and marched to Jamrud and camped there for the night on the 13th. Next day it marched up the Khyber Pass to Ali-Masjid, where the 1st (General Anderson's) Brigade encamped, the 2nd (General Barrett's) Brigade moving further westwards. On the 15th the 1st Brigade left the road and proceeded along a little track on the hillside, where several mules came to grief, then across a river bed of large boulders and late in the afternoon reached Chora. There was some difficulty in finding a camping ground that could be easily defended. The spot selected was rather rough and uneven. Soon after settling down, a good deal of amusement was caused by men here and there suddenly sinking into the ground up to their shoulders and having to be hauled out. The camp was on the site of a Zakka-khel graveyard. There was no chance of moving, for darkness was setting in, but the men gave up taking short cuts. There was trouble about the water here. The river bed was the only way for men and animals to reach Walai, the next camping ground. Winding down the river bed was a small stream which was the only water supply for Chora, and all traffic had to cross the stream several times on the onward journey. At first boiled water was issued to the small garrison left here, but as the men did not like it, cold tea was substituted. A curious incident, which illustrates the character of the

hill man, happened while the hospital was at Chora. One of the inhabitants of a village said to be friendly was shot near a picket. The enemy were sniping from a distance, so there was some probability that he might have been hit by one of their bullets and not by the picket. It was a question of importance, as his relations insisted that he had been killed without his giving any provocation. The body was brought into the village and there examined by two medical officers, the relations being present. They became a little threatening and, when turned away by the guard, were heard to mutter, "A life for a life," and looked very vindictively at one of the medical officers. Two days later that officer was severely wounded by a sniper while making the usual sanitary inspection of the camp. Judging from the direction of the bullet it must have been fired at very close range. Perhaps it was only a coincidence, but it is curious that this should be the only shot that was fired into this camp during the daytime. At Walai the force was encamped in a large basin-shaped nullah surrounded by hills that were easily picketed. There was a narrow gorge running out into the Bazar Valley, and one or other brigade moved out daily into the valley and attacked and more or less destroyed one or more of the villages in the vicinity. The enemy did not put up much of a fight after the first day, but always managed to make things fairly warm for the troops as they withdrew to return to camp in the evening. The villages of Chena, Halwai, Nikai and Jabagai, not to mention Walai and a few smaller ones, are unlikly to forget the visit for a long time to come. During this halt at Walai, the enemy's snipers nightly managed to creep inside the outpost line, and for a short time made good practice at any lights. The headquarters camp got a volley just a few inches above their heads while at dinner and the same night one of the hospital lamps was smashed. The next night a colour-serjeant was wounded. Before very long the troops made pits to sleep in and the hospitals were protected with walls of stones and forage bales. It seems advisable to bear this in mind, for in campaigns of the future snipers may approach on the first night the troops encamp.

The medical arrangements, when the brigades made an attack were for each unit to be accompanied by a medical officer and the regimental stretcher-bearers, and a combined party from the British and the Indian field hospitals to form a movable dressing station. This consisted of three medical officers and assistant surgeons, two nursing orderlies and a few Army Hospital Corps natives, six dhoolies, and about twenty riding animals, a couple of pairs of panniers, some comforts, cooking pots and firewood. This party followed the brigade about, taking care to keep well up, for there was no rearguard. The valley was level, nearly 18 miles long and 6 miles wide. Troops could be kept well in sight, even those on the flanks. Whenever heavy firing occurred some of the dhoolies would be taken in the direction by a medical officer. Every now and then a fire was lit and hot water kept always ready and carried about. When

wounded were brought in a couple of waterproof sheets were spread on the ground, the panniers taken off the mule and the patient treated and dressed, and then he accompanied the party, either on a riding animal or in a dhoolie, until the force returned to camp, for there was no chance of sending him back before. From the camp at Walai sick and wounded were transferred by easy stages to Peshawar, there being a section of a hospital stationed at each of the three camps *en route*. They travelled down in dhoolies, kajawahs, and on mules and ponies. On February 27, some 1,200 Zakka-Khels came in and laid down their arms and a durbar was held. They promised to be good in future and the expedition returned to Peshawar. The last night spent at Walai was intensely cold, snow fell at 10 p.m., followed later by a blizzard of blinding sleet; everyone was drenched to the skin trying to load the mules in the dark; no lights or fires were allowed, for in former times, in spite of all submission, the hill-men could not resist the temptation of having a final go at the troops when they were occupied in packing up, but this time they refrained. Only thirty-five casualties had occurred, and sick were not numerous, but several cases of enteric fever happened after our return, which were attributable to the expedition.

Mohmand Expedition.—The Mohmands, whose country lies due north of Peshawar, had collected a small lashkar or army to assist the Zakka-Khels, but the sudden termination of the affair left them with nothing to do, so they commenced raiding on their own account, and our small garrisons at Shabkadar, Matta and Abazai sent in for reinforcements. These villages are due north of Peshawar, at a distance of 16, 20 and 23 miles. On April 19 some of our troops were fired on, while marching along the Matta Road, three casualties occurring. Matters quickly reached a crisis, for at 2 a.m. on the 20th orders were received to march to Shabkadar at 5 a.m. without any previous warning at all. The night was exceptionally dark. The men on duty at the hospital roused up the others, and the nursing orderlies were luckily met near by. Carts were obtained from the S. and T. Corps, who were quite ready to issue them, and the field hospital was loaded up. After some delay we marched to the rendezvous, and when the troops had all assembled a start was made. The march was long, the heat after 11 a.m. intense, and the road full of dust. Three hundred men fell out on the way and were carried in the tongas and transport carts, but all of them rejoined their units on arrival in Shabkadar. Early next day Matta was reached, and the force settled down in a perimeter camp made by the troops already there. Sniping occurred at night, so large square pits were dug in the hospital camp, the tents being pitched over them in anticipation of there being a considerable number of wounded. Messages from the General during the night failed to reach the hospital, either due to the sniping or to a stampede of horses alarming the messengers, so the S.M.O. was ordered to remain in the Brigade headquarters camp. This was for many reasons a great im-

provement, and facilitated medical arrangements so much that the advantage of a similar procedure being followed in future campaigns is well worthy of consideration. On April 23, large numbers of the enemy were seen coming over the Burjina Pass, and descending to the lower hills, where they appeared to be digging rifle pits. Many were dressed in white, and several carried standards. Some ventured out on the plain which stretched from the foot of the hills to our camp, but the R.F.A. guns persuaded them to quit. It should be mentioned that as a good road was available the hospitals had come out fully equipped with ambulance tongas, and there were sixteen other ambulance tongas in addition. On the evening of the 23rd, orders were received from General Willcocks to attack the enemy on the next morning. General Anderson, who commanded the Matta Brigade, said that, as the enemy were so superior in number, rapid changes in the disposition of our troops might be necessary. He therefore wished all wounded to be removed from the field as quckly as practicable, and only such medical arrangements to be made as would ensure that the free movement of troops would in no way be hampered by them. This order necessitated some little departure from the ordinary procedure as the ox tongas could only move very slowly. The force was about 1,400 strong, and was composed of portions of eight different units.

Medical arrangements were made as follows: Twenty-four well-horsed transport carts were obtained from the transport officer; twelve were fitted for sitting-up patients, and in the other twelve hospital palliasses and pillows stuffed with grass and blankets were placed. Each cart was then placed in charge of a nursing orderly or a selected ward servant.

The field hospitals, less personnel, required for dressing stations were ordered to remain in camp and have everything ready for the reception of wounded.

Two dressing station parties, similar to those mentioned previously as movable dressing stations, with their dhoolies, but with three carts apiece instead of riding animals, were to follow up the advance, one behind the right centre and one behind the left.

The S.M.O. with the remainder of the carts in reserve, extra dressings and comforts, was to follow the centre of the force and feed the dressing station parties with transport, &c., as required.

The ox tongas were to be hooked in and parked near the entrance of the camp, but not to move out unless specially sent for, and then only to come out to meet the carts and take over their wounded.

All carts and tongas when loaded to proceed to the field hospitals in camp, and hand over the patients, and then return to their stations in the field.

A medical officer or an assistant surgeon was told off to each detachment of the force to work with the regimental stretchers and dhoolies.

The Action.—The road runs nearly due north from Matta. The position occupied by the enemy was situated on some low hills parallel with and about two miles from the road, the intervening ground being slightly undulating. The enemy faced the road, and at their back were high hills, over which ran a rough mule track, leading through the Burjina Pass, so their line of retreat was secure. At 6 a.m. on April 24 our troops moved out along the road, and were joined by detachments from Garhi-Sadar and Abazai. They then left the road and advanced in extended order towards the enemy's position, the guns, trotting on ahead for about a thousand yards, took up a position, and opened fire. The cavalry moved up on the right flank. The infantry advanced under cover of the guns, and for a time there was a very heavy and continuous fire. Both bearer parties worked very well, and the supply of carts, &c., to them was carried out quite easily. At times when casualties were numerous some of the reserve carts were sent forward beyond the dressing station parties to meet the stretchers and dhoolies, and to take the wounded from them and bring them directly into the place where the reserve carts were waiting. The dressings were adjusted there before sending the patients on to the field hospitals. With field glasses it was easy to pick out loaded stretchers coming from the front. Some conspicuous object near, such as a bush, boulder, &c., was then pointed out to one of the orderlies in charge of the carts, and he was told to take his cart to the indicated place at a gallop, and to judge the rate at which he could return by the patient's condition. These carts were never fired on, although one or two of them missed their patients, and went on so far that officers at the front ordered them back. Soon after 10 a.m. the enemy commenced to retire up the hills. Our wounded had all been sent to the hospitals in camp when a message was received from the General to withdraw the dressing station parties. A few of the cases who were severely wounded were sent all the way to the field hospitals on stretchers by order of the medical officers. Our casualties were, British 21, Indian Army 35.

Another column was acting on our left in which two casualties occurred. Every medical officer and subordinate worked hard and well, and the General signified his approval of their work.

Next day the whole of the wounded were transferred to the Military Hospital at Peshawar by ambulance tongas.

It may be of interest to point out that any departures from the customary lines for removing wounded from the field is apt to be misinterpreted, for in the following June an article appeared in one of the newspapers of which an extract is quoted below:—

"After the fight at Matta Moghul Khel, where the British casualties were sixty odd, there was not a single dhooly or ambulance, or field hospital or medical organization of any description. The dead and wounded had simply to be carried by their comrades, sometimes several miles, and the chance taken that some kind-hearted regimental doctor,

or apothecary, might be met. It may be added that to carry each wounded man thus takes six rifles from the firing line."

General Sir James Willcocks wrote a strong letter describing every word of this statement as a "wilful untruth."

A short extract is given from an article published in answer to this in the same paper: "Our correspondent and everyone else concerned regret the publication of this inaccurate statement."

The Mohmands suffered very heavily in the Matta fight, for they left some of their dead on the field and temporarily disappeared from that border of their country.

After the fight there was a lull for a week, when an attack was made on Lundi-Kotal which the speedy arrival of the 2nd and 3rd Brigades rendered abortive.

The time up to May 13 was spent in preparing for the advance into the Mohmand country, which commenced on that date, and it is proposed to give a short description of some of the more important events that took place there and a few remarks on duties on the lines of communication in the next lecture.

LECTURE NO. 4.

After the affair at Matta Moghul Khel, the Mohmands withdrew from the border and our forces concentrated at Shabkadar, preparative to a punitive expedition. Two infantry brigades, three mountain batteries and a regiment of Indian cavalry formed the expeditionary force. The wheeled transport was handed in and loads made up for pack animals. The preservation of a sanitary condition of the camps became extremely difficult, as supply convoys were arriving late in the evening and moving off at daybreak the following day. No men except pressed sweepers were available for cleaning up, and there was no sanitary organization or practically none among the Indian troops, who were pouring in daily. Then, to add to the anxiety, cholera broke out both at Matta and Shabkadar. The source of infection, however, was soon traced to the line of communication. Telegrams were sent to warn troops on the way up, but it was not until a considerable number of cases had occurred, and the necessary precautions had been taken of bringing parties through without allowing them to obtain food or drink on the way, that the outbreak ceased. The importance of tracing the source of an outbreak of cholera cannot be overestimated.

On May 13, the force advanced. Nahakki was reached on the 16th, a section of a field hospital being detached on the way at both Dand and at Galanai to provide for the local garrisons and to form transmitting and resting places for sick and wounded sent back from the front. The only

drinking water to be found was in a large pond near the village. The banks were made of earth with clay puddled on the inside to prevent leakage. Rain was the source of the supply. There were no protecting rails or walls to prevent animals polluting the water. The custom appeared to be for the animals to drink from the shallow part on one side, while the inhabitants dipped out their water where the bank was steeper on the other, and the washing was done between. The water was yellow and thick and tea made from it was greyish in colour and unpleasant. Small hand pumps with hoses were used by the troops to draw water from the centre of the pond, and some canvas troughs rigged up. Alum cleared the water quickly, but the Indian troops preferred it thick. Various purifying "tabloids" were tried, but the heat of the sun caused some chemical change to occur in the water so treated, and a very strong flavour of iodoform developed, so the experiment was discontinued. Many of the Mohmand villages have no other water than that obtained from similar ponds, so are dependent entirely upon the rainfall for their existence. From Nahakki the brigades moved out alternately and attacked villages in the vicinity. Sections of the British and Indian field hospitals accompanied the troops and, during an attack, dealt with wounded on the same principle as that adopted on the Zakka-Khel expedition. At night perimeter camps were made. These are roughly circular in shape, the circumference being formed by digging a trench and making a wall outside it with the excavated earth and stones. The troops sleep in the trench, the transport, hospitals and other followers are packed in the enclosure. As a rule a few houses, walls or rocks are enclosed when the camp is constructed to prevent the enemy firing across at the defenders on the opposite side, and to afford some protection to the hospitals, but it is generally necessary to commence making some provision for wounded directly the hospital gets in. This must be done by the hospital staff, for the troops have as much as ever they can do to complete the perimeter before dark, when the enemy's snipers crawl up. Small latrines with a protecting wall should be made just outside the trenches, a gap being left in the wall of the perimeter. When pickets are sent to occupy hills that overlook the camp it is advisable to provide them with some kind of receptacle for urine, &c. It is often impossible for them to leave their sangar at all during the night, as these posts are an attraction to the enemy. The only ones during the expedition were at Lakai and were attacked in a most determined manner, the enemy coming close up to the sangars and killing the greater part of the defenders before assistance could be sent.

On the 20th the 1st Brigade marched northward from Nahakki to make a sweep round the country, and that evening had to fight for the possession of a water-tank. Four officers and twenty-one men were wounded. The following day the advance was continued over a flat valley, the force moving in a square formation, the infantry marching on

the four sides of the square around a struggling mass of men and animals. The cavalry moved round the square, but the enemy managed to get in some long shots. Regimental medical officers and stretcher-bearers marched with their units, and the hospital pack animals with the supply and transport. The hospital dhoolies and riding animals, under medical officers and assistant surgeons, were distributed in a line across the square just in front of the infantry who formed the rear face of the square. This appears to be the best position for bearer divisions in a square, for there is no chance of any wounded being missed. Should the direction be changed on the march it would be possible for the bearers to move round close to the troops to a corresponding position, or to render assistance on any face of the square in the event of an attack. It would be difficult to carry stretchers or dhoolies through the square and cause confusion if attempts were made to pick up wounded among the moving animals. When a man was hit and fell, another fell out and stood over him until the animals passed, and then the bearers coming on just in front of the rear face of the square, lifted the patient into a dhoolie and carried him along, dressings being applied while on the move, and ½ gr. of morphia being placed on his tongue if he was in pain. A few of these little morphia powders may often be useful on service, when there would be delay in giving a hypodermic injection. Syringes have a tendency to go wrong on these occasions.

The only engagement of importance that took place was at Kargha, where several thousand of the enemy blocked the way down the bed of a tributary of the Ambahar river, and heavy fighting occurred before they were dislodged. Some waited too long and were overtaken by our cavalry. The sabre wounds seen were of the back and shoulders, great gaping wounds, but bleeding was not as severe as might have been expected. The men were suffering from shock, but after their wounds had been treated, and they had had a short sleep, they went away. On these frontier expeditions it is advisable to be prepared for a sudden increase in the number of wounded toward the end of an action, for Ghazis may appear on the scene when least expected. These men, for reasons of their own, either religious or bloodthirsty, have made up their minds to sacrifice their lives but to kill as many of the enemy as they can before doing so. Three parties of these were met with during the expedition, consisting of five, six, and eight men. The five concealed themselves in a village which our troops had taken and suddenly rushed upon some sappers who were at demolition work, killing three and wounding two before they were despatched. The eight rose out of a field of corn close to our firing line. The party of six hid in some small ruins and opened fire on the transport column. Generally they were young men between 20 and 30 years of age, and of fine physique.

This kind of warfare is very trying to the troops, and it is chiefly the excitement that keeps them going. The routine is: marching or standing

about most of the day under a broiling sun; a rearguard action on the way into camp; and then furious digging to get the perimeter protection made before dusk. Every night a fusillade into the camp and a rush expected. Sick and wounded accumulating daily and having to be carried on from camp to camp. The day that news came in that the Mohmands had surrendered, our hospitals had been cleared by a convoy from the 2nd Brigade, but within an hour there were ninety admissions. The excitement was over and the men broke down. The total casualties were 257 killed and wounded. There were 185 horses and a large number of mules killed or wounded by gunshot.

Lines of Communication in Savage Warfare.

If the country is not accurately known the sites for posts on the lines of communication are selected as the force advances. Troops to form the garrison are left and with them one or more sections of a medical unit. A perimeter camp is laid out and sangars built for any outposts that are required. The whole force generally halts for the night at or near the spot selected. Unless care is taken to protect the ground chosen for the permanent camp as well as the water supply, irreparable damage may be done during these few hours. Troops going on active service are liable to be careless and have little consideration for those who have to remain. Sometimes they are wilfully negligent. For example, a large body of irregulars instead of using their latrine were seen dotted about all around their camp behind bushes and tufts of grass. Constant vigilance is necessary on the part of the medical officers until efficient sanitary police are available. In the perimeter for the first few days a small night latrine and urinal can be made from empty tin-lined biscuit boxes as a makeshift until a few buckets or pails can be procured. Notices for the direction of troops and convoys halting at the post, showing the camping grounds, watering places for men and animals, latrines, &c., are useful. Each Indian hospital has a set of stencil plates. These notices prevent men and animals being kept waiting about for instructions and the ground being fouled close to the lines of the permanent garrison.

Evacuation of Wounded.—For these expeditions the clearing hospital would be unlikely to prove suitable. A collecting ambulance formed of dhoolies, stretchers, bearers, and riding animals, which could be sent out when required, with the supply convoys, to bring back wounded from the troops at the front, would meet requirements better. In the intervals the medical officer and personnel could be employed in the hospitals at the head of the line of communications. It is as well to hesitate, at least on the Indian frontier, before placing a great deal of reliance on assistance in evacuating wounded from the supply and transport corps. Wounded men cannot travel far, if at all, on a pack-

saddled animal. Even when the roads permit wheeled vehicles it is more than likely that camels instead of carts will be used by the Transport Corps, for the former are the normal Indian transport. The direct system is not always adopted by transport on the line of communication. Staging and meeting systems are not as satisfactory as the direct for severely wounded, for in the latter case the same medical officers and attendants accompany the wounded throughout the journey and hand them over at the base; the better bearers, drivers, and quieter animals are selected for the worst cases, and the vehicles, if any, can be made more comfortable than if they were changed daily.

Report.

THE FOURTH ANNUAL CONFERENCE OF THE NATIONAL ASSOCIATION FOR THE PREVENTION OF TUBERCULOSIS.

By Major S. L. CUMMINS.
Royal Army Medical Corps.

The Fourth Annual Conference of the National Association for the Prevention of Tuberculosis, held at Manchester, on June 5, 6, 7, has a unique importance as immediately preceding the coming into force of the National Insurance Act, a measure which proposes to devote large sums of money to the prevention and cure of this disease. It is obvious that the opinions expressed at the Conference, embodying as they do the latest scientific thought on the subject in this country, should prove of great assistance to the Health Committees in formulating schemes for using the funds to be placed at their disposal under the Act.

The proceedings of the Conference will soon be available, so that an attempt to summarize the various papers is unnecessary, but it may be of value to state briefly the general impression produced by the Conference as a whole.

The whole trend of the discussions emphasized the paramount importance of *tuberculosis as a disease of childhood*, and the points brought most forcibly to the front were as follows:—

(1) That tuberculosis, whilst rare in infants and very young children, is attended amongst them by a rapid course and a high mortality.

(2) With each year of advancing childhood the disease becomes more common and less severe. Tuberculosis is the principal disease of childhood; and there is reason to believe that by fifteen years of age the majority have been tuberculized to some extent, though as a rule not sufficiently to interfere with general health.

(3) In young children the bones, glands, and meninges tend to be affected, thus contrasting with the incidence amongst adults, in whom phthisis is much more common than other forms of tuberculosis.

(4) Pulmonary tuberculosis in childhood is, however, more common than is generally supposed, though often very difficult to diagnose.

(5) Growing children, though so susceptible to the disease, still have a marked power of recuperation if placed under suitable conditions.

(6) Most of the tuberculosis of adults is the germinating of seed sown during childhood.

(7) The best way to solve the question of tuberculosis is to prevent or arrest the disease in children.

This can be attempted (*a*) in the home, and (*b*) in the school. The home period, before the attainment of school age, while perhaps the most important, presents the greatest difficulty. The best prospect would seem to be in tuberculosis dispensaries, through the agency of which cases can be followed up, infective persons "notified," perhaps isolated and educated, and bad home conditions brought to light and improved. The careful supervision of municipal milk supplies on the lines so ably laid down by Professor Delépine, should also lead to good results. In the school the child becomes subject to medical inspection, which, while now admittedly directed to the recognition of clinically evident and therefore advanced disease, should be directed to the early detection of cases. The air-space must be sufficient, the teacher free from tubercular disease—this last a point of very great importance—and the milk supply must be watched.

As to air-space, there seems to be a great future for open-air schools, and while these are at present advocated for children already affected by tuberculosis, there seems no reason why *all* children should not undergo much of their schooling in the open air.

The next point is the removal and isolation of contacts. The teacher, if tubercular—since adults are usually affected with phthisis—is much more dangerous than infected children, as in the latter it is the bones and glands that are the seats of the disease. Periodical medical inspection of teachers, with dismissal and pensioning of all found suffering from tuberculosis, would seem to be indicated.

Children infected with the disease are particularly suitable for sanatorium treatment as, with proper medical inspection, the cases should be detected early, and the recuperative powers of the growing child are very marked. Sanatorium or hospital treatment should be combined with teaching, as long-continued treatment is usually required and the child is usually quite well enough to learn. The splendid results of conservative surgery in tubercular disease in childhood should encourage the building of surgical hospitals for these patients, though these will be expensive owing to the long time necessary for treatment. In the Manchester Hospital for surgical tuberculosis of children, the

average time necessary is two years, the cost £30 per bed per annum, and 80 per cent are known to be well two and a half years after discharge!

The prevention of tuberculosis in children is largely a social problem. Pure air, good and sufficient food, suitable clothing and adequate rest—these will prevent clinical tuberculosis with certainty unless the doses of tubercle bacilli are large and frequent. To bring about tubercular disease "the *soil* must be in a suitable state, the *seed* must be present in suitable amount and for a suitable time."

Important papers dealt with "The Powers and Duties of Sanitary Authorities and the Working of the National Insurance Act in Connexion with Tuberculosis," and with the "Position and work of Voluntary Societies in Connexion with Tuberculosis under the National Insurance Act"; the Countess of Aberdeen also described the work now being carried out in Ireland. These large subjects do not lend themselves to a *précis*, and should be studied in the Transactions of the Conference.

Echoes from the Past.

SOME NOTES OF THERAPEUTICS OF LONG AGO.

By Surgeon-Major-General Sir A. F. BRADSHAW, K.C.B.

I may anticipate inquiry as to the period referred to; it is from the early 'fifties to the early 'eighties of the last century, and probably that interval of time will appear remote enough for reminiscences by a living medical officer. I ought to add that I do not mean therapeutics in general, but merely remedies more or less orthodox employed by myself during the very many years of my service with the Army.

I incline to suppose that as regards the practice of physic in particular, medical men of those far off-days are held by modern votaries of Esculapius to have possessed a very limited acquaintance with the causation of disease and the art of healing. Such an impression may be entertained with some show of reason if comparison be made, say, with the classic of 1857, Watson's Lectures, and the textbook of to-day, Osler's volume of 1909. But although comparative ignorance might be attributable to those practitioners of now ancient date, yet they were carefully observant clinicians and they gained no small success in assisting patients to regain health, or at least in obtaining for them amelioration of

suffering. Some of their methods if practised nowadays might be deemed of somewhat too rough a character, nevertheless their boldly decisive measures very often had the due reward of benefit to the sick.

The knowledge equipment with which men who passed the London College of Surgeons and Apothecaries Hall entered on their practising career was indeed scanty, judged by the present standard of attainments, but a feeling of responsibility for human life, and not seldom for human happiness, actuated men to study their cases with conscientious endeavour, also to ballast the theories prevailing at the time with commonsense deductions from experience personally acquired day by day. Naturally I am a *laudator temporis acti* and disposed to claim that the doctors of half a century ago did very creditably well in their generation ; and further I may assert that very much may be learnt from the records they have left.

The examinations held by the two London licensing bodies, College and Hall, at which the great majority of English students appeared, may be admitted to have been insufficient, but candidates for the Army Medical Department did not escape additional tests. In 1857 open competitions were instituted and consisted of a written part taken in London and a prolonged practical ordeal undergone in the wards of the Military Hospital at Fort Pitt, Chatham, then the headquarters of the Service. Successful candidates were gazetted to regiments and worked therein under the supervision of the experienced officers in charge of the unit. It was on detachment duty in peace time and on active service that the junior doctors became directly responsible for the care of the sick and wounded. Then ensued spontaneous training in self-reliance with quickening of perception owing to there being hardly anyone else to fall back upon, and consciousness of being surrounded by keenly watchful critics of one's professional competence.

During the early years of their military medical duty the young Army surgeons had no option but "*jurare in verba magistri,*" facilities for original research not being available. However, when invested in course of time with the sole charge of regimental medical affairs, mental questionings arose with insistence as to the whys and wherefores of orthodox principles and methods of treating cases. On foreign service medical libraries were not at hand and necessary limitations of baggage led to exclusion of many text-books; hence the Army surgeon was compelled to think things out for himself, aided by the suggestions of accepted principles of medicine and surgery and by the guidance of bedside

observation; also he was obliged to ascertain for himself by actual trial what positive value there might be in the authorized preparations and doses of drugs, and, as well, the really effective quantities of them. Again it was incumbent on the Army man to aim at being an as good as possible all-round doctor, one not at a loss when dealing with diseases of women and children, midwifery cases, insanity, sanitation and military hygiene.

As already mentioned I propose to detail only those remedial measures adopted by myself. I regret being unable to cite written records of cases, my official case-books being I know not where, nor, indeed, if any now exist. But I can report with quite distinct recollection the main outlines of the instances about to be referred to. On this occasion I limit myself to particulars of the treatment of dysentery and intermittent fever, which close clinical observation and much reflection induced me to employ as my standard methods, and I may premise by stating that my professional experience was gained almost entirely in India, whither, on joining the Army Medical Department in May, 1857, I was sent on the occasion of the breaking out of the Great Mutiny, and in which country I served thirty-five years in executive and administrative ranks.

My first acquaintance with cases of dysentery began in 1858 when in camp on active service in the Province of Oudh. A sudden, short and very rapidly fatal epidemic appeared among the men of my battalion (the 2nd) of the Rifle Brigade. The treatment then usual proved unavailing; it comprised ipecacuanha, lead and opium, bael fruit, &c., &c. The cause of the outbreak was obscure, but the conditions of camp life were eminently unfavourable to health. The heat of the wind and sun was fiercely great; military duties involved hardships and exposure to night air; the men had to sleep on the ground; spirituous liquors were a scarcely stinted issue; water was impure, and the rations dirtily cooked. In 1859 the battalion was installed in new barracks in Lucknow, and cases of dysentery occurred, some of sloughing character; I saw some intestinal casts quite a foot in length. The same remedies as before were again employed, and this time with better result, probably because the circumstances of the soldiers' existence had become markedly easier.

During the following years cases of dysentery frequently came under my immediate care, and I recognized that ipecacuanha was the remedy of chief advantage. But the ordinary way of employing that medicine seemed to me to be wrong, for the reason that it was always given by mouth, to the grievous disturbance of the stomach.

I thought that to treat a disease occurring near one opening of the body by pouring medicines into the other and distant opening was not judicious, and I resolved to try the plan of keeping the mouth for food, and the rectum for medication, the abdominal surface being dealt with by derivative applications. This new method required close attention to details. I had the lower half of the body encircled with spongio-piline retained in place by end-tapes tied together; this piline was kept sprinkled with turpentine liniment in quantity sufficient to cause and maintain uniform redness of the skin, a redness intended to continue many days, and, as a rule, the piline was not changed while its texture remained serviceable. Of course this item of treatment had for its object persistency of co-operation in mitigating the internal mischief. I discarded the customary hot water fomentations for the reason that their derivative effect was so transient—as that of wet warmth so applied generally is—and, besides, so inconvenient to carry out properly. After clearing out the bowels with castor oil, to which a little carbonate of soda had been added for neutralizing any rancidity possibly in it, I prepared a mixture of a drachm of powdered ipecacuanha, 2 gr. of extract of opium, and an ounce of hot water. The rectum was then washed out with a pint of warm water thrown in quickly in order to stimulate it to get rid of the quantity speedily. The mixture when it had cooled down sufficiently was drawn off the dregs and slowly passed in, the patient being urged to make effort for retaining it, by hand pressure if needful. This medicine rarely failed to give marked relief, and it was repeated so frequently as at intervals of three hours, if the dysenteric symptoms appeared to call for such renewals. I found this treatment so generally successful that it became my ordinary course. The stomach function not being interfered with by nauseating or other drugs, food was taken and nutrition duly went on, the general strength being thus maintained.

In one case, that of a little boy, I had to resort to treatment somewhat heroic. He was too young to have sense of the necessity for submitting to remedial proceedings and his disease became rather alarmingly severe. The bowel protruded, and showed a bright red surface, and the straining was strong. The father grew restless with anxiety, the mother tearful, and the domestics agitated. Clearly there was a crisis, and something had to be done, and done without delay. I decided to try a novel plan. Forty grains of nitrate of silver were dissolved in an ounce of distilled water, and after gently bathing the inflamed membrane

with tepid water, I injected the whole ounce well into the rectum, with, of course, the effect of whitening the whole exposed and near internal mucous surface. The result was immediately beneficial; the tenesmus ceased, the boy was quieted, and, in fact, the inflammation was cut short. The case thereafter gave no trouble at all, and recovery was completed very soon.

I may here mention that on meeting with a case thought by the patient to present indications of dysentery, I made it a rule to examine the anus before accepting the amateur diagnosis, in order to be certain that I had not to deal with inflamed or bleeding piles, ulcerous fissure, or anything else. And it is worthy of record that on very rare occasions I have met with cases of dysenteric discharge from the bowel as vicarious to sweating after the hot stage of ague.

Of chronic dysentery my experience was not great. Soldiers who had suffered badly from dysentery were invalided for the benefit of the sea voyage and change to England, the men being for the time useless as fighting units of the Army.

Before leaving the subject of my old treatment of dysentery, I should like to mention a case of diarrhœa which was prevented from terminating in death by a curious expedient. The patient was a young woman, the wife of a soldier. She was in hospital with a diarrhœa that no drug at my command, nor any form of treatment I could devise, had any effect in controlling. She became emaciated to a degree I had never seen before nor since observed; her skin was tightly drawn on her facial and body bones, and her rectum stood open, like the entrance to a tunnel. The bowel flux stopped for want of material, and evidently she was dying of starvation, as food even of liquid consistency she could hardly at all be got to swallow. In despair I tried, as a last hope of stimulating her palate, a well-known table sauce, and the one hit upon was fortunately successful. Moistening with this a few crumbs of bread, I placed them between her lips, and waited with anxiety. Very feebly she began to munch, to my intense relief; and I may say that her progress to recovery could be dated from that moment. By slow degrees suitable foods were taken, nutrition recommenced, she filled out and ultimately regained excellent health and strength, and convalescence was not interrupted by any recurrence of the diarrhœa.

I turn now to the treatment of intermittent fever commonly called ague. A very short residence in India, in the Upper Provinces in particular, is likely to make a newly-arrived medical man acquainted, sometimes personally, with fever of this harassing

and returning kind. Between 1858 and 1868 I had occasionally cases under observation, and in the latter year very extensive opportunities of studying agues came in my way. I was stationed at Kasauli on a Himalayan hill, some 6,000 feet above sea level, where there was a military depot, termed convalescent, for the reception of soldiers from the plains, weakened there by fever chiefly. About 200 men were assembled in 1868, and all presented cases more or less interesting. As soon as it was convenient after their arrival, I had them sent to the hospital in morning batches, and auscultated and palpated every man. In many of them I found enlargement of the spleen with or without tenderness of the liver; in others cardiac murmurs with anæmia; some had a tendency to phthisis. Now and then a man would say, "Please, sir, there is nothing the matter with me," and evidently was reluctant to be "vetted," and possibly have a loose screw discovered in his frame. My answer was, "You have been sent up here for the benefit of your health, and it would be satisfactory to me, if not to you, to know the actual state of that health, as I am medically responsible for you while at the depot." This usually seemed a convincing reply—anyhow, the demurring man had to submit!

I may digress to mention that a regimental brother officer of mine often consulted me for minor ailments, but nothing would ever induce him to allow a stethoscope to come near his chest. "No, no," he would say, "I am so afraid of your finding something wrong with my heart or lungs, and I prefer to remain in ignorance." Another officer friend, troubled with bleeding piles, would never permit me to lay my hand upon his bare abdomen. He said that a nervous shrinking which he could not restrain absolutely forbade approach of a hand not his own. I wished to palpate the hepatic region, as a sudden cessation of the hæmorrhoidal flux had made me suspect liver complication. He died some time afterwards in another hill station from collapse following a trocar stab, without chloroform, of the liver for abscess.

Of the convalescents—as the depot men were collectively styled—a good number soon regained health in the cool mountain air, but a large minority had attacks of ague, and for these men curative measures had to be thought out.

The ordinary treatment of intermittent fever which I had noticed hitherto appeared to me to be unsystematic. Quinine was, I may say of course, the remedy chiefly resorted to but it was administered anyhow, that is, during the hot stage or the sweating stage or immediately after the whole paroxysm had ended. Occa-

sionally it was borne in mind that the drug was credited with antiperiodic power, but it was given in variable or haphazard quantity any time before the recurrence of the cold stage. As to popular faith in the panacea virtue of quinine whenever taken, I have seen a man cover the palm of his hand with it and then lick up all as if it were sugar! And I regret to say I have witnessed the barbarity of giving a poor little child a splitting headache with a dose of 5 or 6 gr.

Having become fully impressed with belief in the antiperiodic method, I experimented largely with febrifuge medicines (salicine, bebeerine, Warburg's tincture, the Indian kutkuleja, and others) and ultimately found myself obliged to trust almost exclusively to quinine. It occurred to me that quinine, if given with antiperiodic intent in a large single dose, might easily chance to be not well timed and to have a merely explosive effect. If a pebble be dropped into a pool the ripple soon dies away, but if one be dropped in at suitably regular intervals, the rippling can be kept up for any desired length of time. I applied this principle to the use of quinine, and the plan eventually adopted was to ascertain from the patient as nearly as possible the precise time for the cold stage to make its very first indication, and then to supply him with doses, one to be taken every half hour, beginning six or even four hours previously. The doses were pillular and the excipient glycerine chosen to prevent hardening of the pills. At first I limited each dose to 1 gr., but often half was found sufficiently effective. These repeated small doses neither disturbed the brain nor the stomach, and they proved so generally successful that I made the plan a routine treatment. Once I had under my care a woman with a spleen so large as to compete with her gravid womb for accommodation within the abdomen; her ague was quite controlled by the frequent and properly timed half-grains. I remember the case of a soldier who had enormous enlargement of his spleen, and ague so obstinate that the only way by which I could avert a paroxysm was by giving him a prolonged and very warm bath an hour before the cold stage. He had to be invalided, however, as permanent benefit appeared to be quite improbable unless he were sent for a voyage and change to England. I do, though, recollect a few instances of ague-plagued men who completely recovered after two successive whole years in the hills; their progress was slow but the two winters as well as summers out of the plains at last re-established them in health and vigour.

In a later year my experience in treating cases of intermittent

fever received very considerable amplification. I was then serving in a cantonment in the plains, and in addition to my regular duties, had to take, temporarily, charge of a regiment of native infantry. I duly presented myself at the regimental hospital, and was met by the native doctor of the regiment, a Mūsălmān, one of a class of men educated under Government arrangements in elementary medicine and surgery, then enlisted as hospital assistants and posted to native military hospitals for duty under the medical officers in charge; many of these men are surprisingly competent practitioners. I found the hospital full of patients, most of them down with ague. I inquired what was the ordinary treatment pursued, and was told that arsenic was the drug principally employed. Further questioning as to preparation and doses elicited that Fowler's solution was used, and the dosage 30, 40, 60, 90, and even 120 minims. At this information I was considerably astonished, and asked what was the rate of mortality. The doctor grinned, and said there had not been any inquests! Of course, I was amazed at the hugeness of the arsenical doses, having been brought up to believe 3 to 5 minims three times a day for short periods a quantity which ought to be carefully watched for harmful effect. However, I was soon convinced by results before me then that arsenic was a most valuable alternative to quinine, and that such dosage was really permissible. In my own subsequent practice the method of administering it was as follows: An hour before the cold stage was expected to begin, the patient had to eat some bread or a biscuit (it being inadvisable to have quite an empty stomach), and then to take 30 minims—or more, according to the expected severity of the ague attack—of liquor potassæ arsenitis in water well flavoured with a carminative, and next to lie down well covered up. If this first dose failed it was increased next time to 60 minims, and if that increase did not succeed, the quantity was for a third time made up to 90; very seldom was it necessary to prescribe 120 minins. Not oftener than once a day for three successive days was this medicine given, and I never met with an instance of consequent stomach irritation or any other inconvenience. To children I did not administer arsenic, being uncertain as to toleration of it by the young, and as to a safe dosage; halves or thirds of a grain of quinine were preferred.

As a concluding reference to the subject of intermittent fever I may record a case which in my experience was a solitary one. A young married woman came under my care with ague which

at first was quartan, then became tertian, next quotidian, and finally merged into a continued fever which ran an uneventful course to complete recovery. My antiperiodic treatment with quinine, although carefully followed, quite failed to arrest the intermittency.

I could discourse at length upon various professional subjects which I had to deal with in my days long bygone, such as occurrences more or less remarkable in general practice, experiences with children, psychologic management of patients and of patients' friends, &c., but this paper is long enough already.

Reviews.

FOURTH REPORT OF THE WELLCOME TROPICAL RESEARCH LABORATORIES. Vol. B.

The separation of the "Fourth Report of the Wellcome Tropical Research Laboratories" into two volumes, the one devoted to Tropical Medicine and the other to General Science, marks a stage in the evolution of these valuable publications and holds out a promise of still further subdivision in the future. The field for research presented by the Anglo-Egyptian Sudan is so large and the quality of the work already produced so high that investigators in many different departments of science greatly value the publications emanating from the laboratories of the Gordon College. It is, however, inconvenient for the anthropologist anxious to possess himself of Dr. Seligmann's work on the Shilluk to be obliged at the same time to purchase a number of excellent—but, to him irrelevant—papers dealing with agriculture, mining, town planning, &c.; while a biologist to whom Professor Werner's able monograph on Scorpions is indispensable may have no wish to peruse Mr. Butler's description—so interesting to ornithologists—of the Finches and Weaver birds of the Sudan. May we suggest, as the only criticism that we wish to offer, that it would be a boon to the reader if the Director of the Wellcome Tropical Research Laboratories could see his way to issuing separate monographs on lines similar to the "Scientific Memoirs to the Government of India," instead of allowing the work of various observers to accumulate to the dimensions of a large volume. This would not merely place at the disposal of each purchaser exactly what he requires, but would avoid the delay in publication so likely to deprive a scientific paper of much of its value.

The foregoing remarks will serve to indicate the wide field covered by volume B, the subject of the present Review, and whilst it is true that all strictly medical questions have been dealt with in another volume, there is still a very large amount of matter with a direct bearing on medical work in the papers classed as "general science." Dr. Beam, in the "Report of the Chemical Section," deals exhaustively with the

Khartum water-supply, a subject of great interest to all who may be concerned with medical administration in tropical climates. The so-called "deep-wells," at first introduced at Khartum, furnished a water-supply rich in manganese and iron which speedily fulfilled the prognostications of its scientific critics by producing a copious growth of *crenothrix*. This was got rid of by deepening certain of the wells, cutting off the upper strata, through which adventitious waters were able to percolate in a manner fully described by Dr. Balfour in volume A, and bringing the water to the surface by means of an air-lift pump. "As a result of the very efficient aeration due to the air-lift, not only is the iron oxidized and precipitated, but what was entirely unexpected, the manganese is carried down as well. The precipitation of the iron and manganese probably also aids the direct oxidation of the small amount of organic matter present, the effluent water attaining a remarkable degree of organic purity."

The chemical section is also represented by an interesting paper by Dr. James Thompson on the latex of *Calotropis procera*, the *Ushar* plant, which is said to be frequently used as a poison both in the Sudan and in India. Should the tests suggested by Dr. Thompson in this preliminary note prove to be as reliable as the author hopes, he will have made a valuable addition to the resources of medico-legal work in tropical climates. The papers by Dr. Henry Curtis and Sir Thomas Fraser on the spitting snakes of Southern Rhodesia and the Sudan spitting snake are also of interest and importance to medical men.

Perhaps, however, the report of the entomological section contains more matter of medical interest than any other part of the volume. Mr. Harold King contributes an article of the highest value to all whose duty leads them to the study of tropical disease. His descriptions of blood-sucking flies and other insects, beautifully illustrated by plates from the hand of Mr. A. J. Engel Terzi, should prove of great assistance to medical officers serving in Africa. Mr. King describes five new species of mosquitoes and one new sub-species, and gives a list of blood-sucking flies other than mosquitoes recorded from the Anglo-Egyptian Sudan, with the localities in which they are known to occur. While the *Glossina palpalis* has only been recorded in the Lado and circumscribed areas in the Bahr-el-Ghazal, the wide distribution of *Glossina morsitans* both in the Bahr-el-Ghazal and Khordofan assumes great importance in view of recent work on the *Trypanosoma rhodesiense*. It is interesting to note that, while kala-azar is decidedly common in the Eastern Sudan, *Cimex rotundatus* has only twice been recorded, being found, not on residents in the Sudan, but on pilgrims from Mecca. The common bed-bug of the Sudan is *C. lectularius*. Workers at the various spirilloses will appreciate the synoptic table on Sudan Ticks on p. 129. A short paper by Dr. W. M. Aders on *Herpetomonas aspongopi*, a flagellate parasitic in the melon bug, *Aspongopus viduatus*, is of great interest. The great similarity of the organism to the Leishmania parasites and the fact that it is parasitic in an insect that does not suck blood, gives this work additional importance. Anthropology is well represented by an article of the highest interest on "The Cult of Nyakang and the Divine Kings of the Shilluk," by Dr. C. G. Seligmann, and an account of some tribal customs, in their relation to medicine and morals, of the Nyam-nyam and Gour peoples inhabiting the Bahr-el-Ghazal, by Captain R. G.

Anderson, R.A.M.C. Those who are familiar with "The Golden Bough" (Dr. J. G. Frazer) will appreciate the great importance of Seligmann's description of the divine kings of the Shilluk. The spirit of Nyakang, the first of the long series of Shilluk kings, is believed to become immanent in each of his successors, the spirit being transmitted by means of a ceremony at the time of the new king's accession. While every precaution was taken against the accidental death of these "divine kings" there is no doubt that they were *killed* in order to avoid the disasters that their senescence was thought to bring upon the State." According to Shilluk folk-lore any one of the *niäret* (sons of a king) has the right to attempt the life of the reigning monarch, and, if successful, to reign in his stead. The killing could only take place at night, and the picture of the unhappy ruler "prowling round his huts, fully armed, peering into the shadows, or himself standing silent and watchful in some dark corner" excites no envy for the lot of a divine king. Captain Anderson's contribution to the anthropology of the Bahr-el-Ghazal tribes is as interesting as his paper on the people of Khordofan in the third report. It is to be hoped that his example will stimulate other officers of the Royal Army Medical Corps to use their opportunities to investigate and record the customs and beliefs of the primitive peoples with whom they may come in contact.

The Director of the Wellcome Tropical Research Laboratories and his keen and able collaborators are to be congratulated on a magnificent addition to the records of the work of Europeans in Africa

S. L. C.

A Simple Method of Water Analysis. By J. C. Thresh, M.D., D.Sc., D.P.H. London: J. and A. Churchill. Seventh Edition. 1912. Pp. 65. Price 2s. 6d. net.

This little book is specially designed for the use of Medical Officers of Health, and can best be described as a short account of how to use Messrs. Burroughs Wellcome and Co's "soloid" brand products for making a rough chemical analysis of water and sewage. The description of the various processes is short, clear and easy to follow, but in actual practice the real difficulty lies in the reading of the result. For instance, the estimation of the amount of nitrates in water from the colour produced with metaphenylinediamine and sodium acid sulphate (after reduction) is likely to be very unreliable in the hands of any but a practised analyst. The notes on the interpretation of results, in which great stress is laid on the inspection of the source of the water, are excellent, as one would expect from the pen of Dr. Thresh. One-third of the book is taken up by examples of various waters and sewage effluents examined by this process, and reports upon them, and for comparison a table is given at the end of the book showing the corresponding figures obtained by the ordinary methods of analysis in a laboratory.

The results obtained by the "soloid" process are no doubt of value in the hands of a skilled water analyst like the author, but can at best be only a rough guide to the quality of a water. To anyone equipped with a "soloid" analysis outfit this book would be invaluable, but to the Army Medical Officer it will not be found of great assistance, the

methods described being not so generally adopted in the Army as the author states in the preface.

H. B. F.

AIDS TO HISTOLOGY. Alexander Goodall, M.D., F.R.C.P.Edin. London: Baillière, Tindall and Cox, Ltd. 1912. Pp. viii. and 135. Price Cloth 2s. 6d.; Paper 2s.

This is another of the Student's Aid Series, and in common with the rest of the series it is intended as a means of refreshing the memory and not as a substitute for a text-book.

The author has been very successful in his "attempt to present the essential facts of histology in small compass," and justifies his claim that this book will be found useful by both junior and advanced students.

There are eighteen chapters, each one dealing with a special tissue or system or set of organs. Two chapters are devoted to the central nervous system. The last chapter is a *résumé* of the chief methods employed in histological examination, and is useful.

J. C. K.

FIRST AID TO THE INJURED AND SICK: AN ADVANCED AMBULANCE HANDBOOK. By F. J. Warwick, B.A., M.B., M.R.C.S., &c., and A. C. Tunstall, M.D., F.R.C.S.Ed., &c. Bristol: J. Wright and Sons, 1911. Pp. xiv and 246. Price, Paper 1s. net; Leather 2s. 6d. net. Seventh Edition.

The book is clearly written and well illustrated throughout. There is a good index and the headings of the paragraphs being in heavy type are easily turned up for reference. Part I, Anatomy and Physiology, and Part II, to the end of Chapter XVII. on bandaging, &c., are little altered from the preceding edition, which is a matter of congratulation, as this part of the work left little to be desired, and contained all that was necessary from a first-aid point of view. Chapter XVIII, dealing with transport of sick and injured, has been considerably enlarged and brought up to date; many excellent illustrations have been added, dealing with stretcher and wagon exercises. The clearness of these illustrations alone would render the book valuable to anyone studying the subject.

G. G. D.

DIE INFANTERIE - DIVISIONSSANITÄTSANSTALT MIT FELDAUSRÜSTUNG. MILITÄRÄRZTLICHE PUBLIKATIONEN. Nr. 137. [Field Ambulance with Field Equipment (Austro-Hungarian Army.)] By Lieutenant-Colonel v. Hoen, General Staff, and Dr. Szarewski, Senior Medical Officer of the 34th Landwehr Infantry Regiment. $9\frac{1}{4}$ in. by $6\frac{1}{4}$ in. Pp. 122. Some diagrams. Safar. Vienna. 1911. Price 4s.

This handbook has been compiled from official manuals, and furnishes a complete guide to the Austrian field ambulance; it is evidently intended for the use of medical officers of the reserve.

The first chapter enumerates the personnel and equipment, and shows how the unit falls in on parade, its order of march, &c. The next chapter sketches out very fully the tactical employment of the unit in different military situations. It is interesting to note that the suggested establishment of the "slightly wounded station" comprises the following sections: (1) For receiving patients; (2) for the dying; (3) for those awaiting dressing; (4) operating and dressing room; (5) for wounded

unfit for transport; (6) for patients ready to be evacuated as sitting-up or lying-down cases; (7) for dressed patients able to march; (8) a large space for slightly wounded likely to be fit for duty at an early date. In addition to these sections there is a kitchen, an office and a wagon park for the two vehicles which carry the equipment and supplies for the slightly wounded station. According to the above scheme the slightly wounded station has the same organization as the dressing station, the only difference being in the relative spaces assigned to the different groups of wounded. When discussing the duties of the slightly wounded and dressing stations, the personnel and work of each sub-division is very fully described. A large section of the chapter is devoted to a consideration of the operative work which should or should not be undertaken for different kinds of injuries.

In the chapter on rations and dieting it may be noted that the Austrian field ambulance has a wheeled kitchen capable of cooking for 250 men. The art of living on the country by requisition, purchase, or capture is concisely explained; specimens of requisition, receipt, and accounting forms are given. Pay duties are fully described; the work concludes with tables of medical and surgical equipment.

By perusing this work an officer, who, for any reason, is not familiar with the working of a field ambulance, should be able to acquire a fairly intimate knowledge of the subject in a comparatively short time.

C. E. P.

THE THERAPY OF SYPHILIS. Its development and present position, by Dr. Paul Mulzer. Translation by A. Newbold. Publishers, Rebman, Ltd. Pp. xv and 247. Price 6s. net.

This is a translation of a work by Mulzer, which was completed in December 1910, and is now published in English. The author is a colleague of Professor Uhlenhuth, and naturally supports Uhlenhuth's claim that his researches on the use of atoxyl in diseases caused by spirochætes laid the foundation of the modern chemotherapy of syphilis.

The work deals chiefly with the use of arsenical preparations, and, though the author states that mercury is without doubt the most powerful and effective remedy against syphilis, he devotes only a small portion of the first chapter to a recapitualion of the general principles of mercurial therapy. The remainder of the book deals with atoxyl, arsacetin, atoxylate of mercury, hectine, soamin, arsenophenyl-glycin, and especially with salvarsan, to which 160 out of the total 204 pages are devoted. As was usual with books on salvarsan which were published at such an early date in the history of the remedy as eighteen months ago, most of this work is composed of extracts from the writings of others on the subject. This was naturally unavoidable when authors had only a limited personal experience of the drug, but second-hand opinions can never be so useful to the reader as those of an author whose experience would now qualify him to write on this subject, and we cannot help thinking that the interest of this book is now historical rather than practical.

A translator must, of course, keep faithfully to the original text, even at the expense of style, but the translation may easily fail to convey the author's meaning by being too literal, as in this sentence, which occurs on p. 76, and is an example of many others which we found in this book. "We first fill the syringe with physiological saline solution; then, with

the tap open, pierce into the vein, and while the ligature is still in position, make the injection, only syringing in the saline after blood has poured in distinctly." A reader with no personal experience of the technique of salvarsan injections would find some difficulty in making out the meaning of the following sentence which occurs on the top of the same page. "It is very important that the cannula should rest properly in the vein, and that on puncturing no further injury should be done, which may easily happen if the syringe is too long; therefore, I only have the syringe obtusely bevelled." In this case our recollection is that the author from whose work this extract was taken, used a word which means (needle) "point" instead of the very similar one which means "syringe." Presumably, the stand described on p. 78, was 1 metre and not 1 millimetre high, but "a thin rubber tubing, about 12 c.c. long," conveys nothing to us.

L. W. H.

THE WELLCOME PHOTOGRAPHIC EXPOSURE RECORD AND DIARY. Price 1s. net.

This book, in a size suitable for the pocket, is issued in wallet form with pencil and book-marker. It contains all the information which is likely to be required by both beginners and advanced workers in photography.

The first portion is devoted to the description of modern photographic methods, especially with reference to the use of tabloid chemicals, and deals with the development of various brands of plates and films, and the many printing processes on plates and papers and the manner of remedying technical defects. The factorial method of development is fully elucidated, and so-called colour photography is briefly but satisfactorily alluded to.

Full information is given with reference to postal arrangements and how to obtain a permit to photograph both at home and abroad.

Next follow some 150 pages in photographic diary form, each page having suitable headings relating to plate and film, subject, time of exposure, result, &c., in which the enthusiastic worker can enter full particulars and keep up a permanent record of each exposure.

The book closes with a section dealing with exposures, an ingenious but simple form of exposure calculator being fastened on to the inside of the back cover. In this section are given tables of light values for each day of the month, factor for subject, and for plates. If the instructions are closely followed the merest beginner should find no difficulty in judging very approximately the exposure of any subject at any time in any country. The book can be confidently recommended.

E. E.

KALA-AZAR BULLETIN, No. 2, March 22, 1912.

This publication is of great value to students of tropical medicine. To this number Dr. Wenyon has contributed a masterly summary of the literature of infantile kala-azar after consulting 149 papers. A map is given which shows the distribution of kala-azar and oriental sore in the Mediterranean area, Asia Minor, and Persia. For diagnostic purposes, Nicolle advocates splenic puncture, since out of seven examinations he found the parasites in the peripheral blood of only one patient. A short steel needle should be used, and the abstraction of blood avoided, since

the small quantity of splenic cells withdrawn may be obscured. Two or more aspirations with separate needles may be necessary. Cochran detected Leishman's bodies in the glands of the groin, or neck, which had been removed under local analgesia, in seven cases. Complement deviation tests have been successful, when kala-azar spleen extract has been used as antigen. The natural infection of a cat has been recently recorded. A child and a dog in the same house also harboured the parasite. No great advance has yet been made in the treatment of kala-azar. Colloidal silver, mercury, atoxyl, arseno-phenyl-glycin, salvarsan, antimony preparations, and X-ray therapy have failed. Splenectomy is not a rational procedure, since the Leishman bodies are not confined to the spleen. The failure of salvarsan was not expected, since it is capable of arresting the infection in dogs. Moreover Nicolle has reported two cases of oriental sore cured by its means. Broome recommends CO_2 snow for this condition; he finds that ulcers which have resisted other treatment yield to a single application. C. B.

GONOCOCCAL INFECTIONS. Major C. E. Pollock and Major L. W. Harrison, R.A.M.C. Oxford Medical Publications. London: H. Frowde, Hodder and Stoughton. Pp. xxi and 222. Price 5s. net. 1912.

The authors are to be congratulated on having compressed into 220 pages an account of all the important recent advances which have been made in the pathology and treatment of gonorrhœa. They have produced a work which should be in the hands of every officer of the Corps. Gonorrhœa is not the trivial ailment which we once deemed it. Gonococci may exist for years in people who think that they have recovered from the infection. A picture is painted of the evils which may result from such latent cocci; husband, wife, or offspring may be the innocent victims. Unfortunately, treatment is too often ineffective in these cases, hence no effort should be spared to prevent infection with this micro-organism. Future generations will look back with wonder at the waste of life and health caused by these preventable microbic diseases. Doubtless their incidence has been lessened through religious teaching, yet they will not be entirely eradicated by this means. For there are some in whom the sense of moral obligation is but ill-developed. It is necessary from utilitarian motives to teach such delinquents how to sin aseptically, when they stray from the path of virtue, so that their wrong-doing shall not endanger the public weal. According to the authors, the use of 20 per cent. protargol in gelatine and of 33 per cent. calomel ointment have greatly reduced the incidence of venereal diseases in the German and American Navies.

The instructions given for the cultivation of the gonococcus are full and detailed. If they are accurately followed, success will be ensured. It must be remembered that it is a delicate organism which is unable to grow on ordinary media. The preparation and use of gonococcic vaccine are fully described. The authors' experience with vaccine-therapy in gonorrhœa agrees with that of other observers. Though the urethritis is not influenced in a marked degree, good results are obtained in the complications. The practitioner will find ample particulars for the dieting, nursing, and treatment of gonorrhœa and its sequelæ. We recommend with confidence the work under review as the most lucid, accurate, and scientific exposition of the subject in the English language. C. B.

ARMY REVIEW. PART II. SECTION I. BIOGRAPHY. MEMORIES OF THE CRIMEAN WAR, JANUARY, 1855, to JUNE, 1856. By Douglas Arthur Reid, M.D., formerly Assistant-Surgeon, 90th Light Infantry. 11¼ in. × 7¾. Pp. 206. Illustrated. London, 1911. The St. Catherine Press. Price 21s. net.

This book has been compiled with the aid of letters written in the Crimea and sent home each week by the author. His experiences and various episodes which occurred during the siege are, consequently, told as if they had only recently happened. They furnish a graphic description of the acute discomforts which the besieging army had to put up with and of the excitement provided by duty in the trenches. The misery endured by the sick and wounded, and which the medical officers were powerless to alleviate, must have been intense. Most of the numerous photographs have been reproduced from originals taken on the spot, and are, therefore, of great interest. C. E. P.

Current Literature.

Army Medical Report of the Prussian Army (including the Saxon and Wurtemberg Army Corps) for the year October 1, 1908, to September 30, 1909.—The average annual strength of the Army was 545,916. The admissions to hospital during the year were:—

Per 1,000 *of strength.*

Military hospitals	Barrack hospitals	To barrack and military hospitals	Total
196·8	348·5	53·4	598·8

The average annual admission ratio in previous quinquennial periods was: 1881 to 1886 = 899·6; 1886 to 1891 = 908·3; 1891 to 1896 = 812·2; 1896 to 1901 = 687·5; 1901 to 1906 = 610·3. In the year 1906-07 it was 601·8, in 1907-08 it was 588·4.

The Army (excluding officers) was composed of: 79,048 under officers; 438,274 lance-corporals and privates; 11,017 one-year volunteers; 17,577 reservists (calculated as mean annual strength).

Of the above 223,229 men were in their first year of service; 205,892 men were in their second year of service; 116,795 men had served for more than two years.

The ratio of admissions to hospital per 1,000 of strength of each category was as follows: Under officers, 402·2; lance-corporals and privates, 630·1; one-year volunteers, 875·1; reservists, 528·5.

The ratio of admissions by years of service was: In first year of service, 842·3; in second year of service, 433·9; in later years of service, 423·8.

The death-rate was the same as in the two previous years, viz: 1·8 per 1,000.

The 15th Army Corps (Strassburg) had the lowest admission ratio, and the Guards Corps the highest.

The average constantly sick was 25·2 per 1,000 of strength, of which

17·6 were patients in military hospitals, and 7·5 were treated in barrack hospitals. The average duration of treatment per patient was 15·0 days. The average stay in military hospitals was 24·7, and in barrack hospitals 7·9 days.

The average sick time per soldier was 9·2 days.

The greatest number of admissions was for mechanical injuries and diseases of the skin and connective tissue.

INFECTIOUS DISEASES.

Small-pox.—Two mild cases occurred in Eastern Prussia.

Vaccination.—236,074 vaccinations were performed in the Army; of these 231,169 = 97·9 per cent were successful. Animal lymph was used in all cases.

Scarlet Fever.—672 cases were admitted, of which 29 died.

Measles.—408 cases were admitted; there were no deaths.

Mumps.—470 cases were admitted; there were no deaths.

Diphtheria.—511 cases were admitted; of which 12 died.

In one case living bacilli persisted for three months in spite of treatment. They disappeared after the man had received a series of inoculations with killed cultures.

Typhoid Fever.—During the year 206 cases (= 0·38 per 1,000 of strength) were admitted to hospital; of these 26 (= 9·6 per cent) died. The average time of treatment was 54·9 days. Of the number admitted 7 men (=3·4 per cent of all admissions) had been engaged in nursing typhoid patients.

Tuberculosis.—950 cases (= 1·7 per 1,000 of strength) were admitted during the year, of which 43 returned to duty, 100 died, and 836 were discharged otherwise. The regions of the body affected were as follows: Acute miliary tuberculosis 19 cases, lungs and air-passages 723 cases, bones and joints 66 cases, internal organs 142 cases.

The incidence of tuberculosis per 1,000 of strength has fallen steadily from 3·3 in 1890-91 to 1·7 in 1908-09. The greatest incidence was in the month of October, when the year's contingent of recruits joined, and the lowest incidence was in September. More than half of the cases occurred during the first year of service. The average time in hospital for each case of tubercle of lung was 60·5 days.

Diseases of the Nervous System.—The admissions for all diseases of the nervous system numbered 4,070 = 7·5 per 1,000 of strength. This shows a slight increase over the admission ratio for the previous year, and is 2·2 per 1,000 above the rate for 1896.

Diseases of the heart caused 1,793 admissions (= 3·3 per 1,000 of strength); 11 died, and 1,489 were discharged otherwise.

Venereal Diseases.—There were 10,572 admissions (= 19·4 per 1,000 of strength); this is a slight increase on the admission rate for the previous year. Gonorrhœa and its sequelæ accounted for just two-thirds of all admissions for venereal diseases, while syphilis caused more than twice as many admissions (4·7 per 1,000) as soft chancre. The highest monthly incidence was in October, when the fresh contingent was embodied. The incidence of venereal disease varies directly with the size of the garrison town. In towns of 400, or fewer inhabitants, the incidence was only 5·8 per 1,000 of strength, while in towns of over 10,000 the incidence rose to 25·9 per 1,000. The incidence also increases

with length of service; thus, if those who were found to be suffering from venereal disease on enlistment are deducted, the incidence was, in the first year of service 12·0, in the second year 17·1, and in other years of service 21·8 per 1,000.

Gunshot Wounds.—There were forty-three admissions for bullet wounds of which nine recovered, the remainder being fatal. In one case a man was shot at a range of 1,000 metres with the new "S." bullet. The bullet entered at the upper portion of the left temple, and made a track 4 cm. in length in the scalp. The man made a perfect recovery. In another case a "S." bullet fired at a range of 800 metres ricocheted off the target, and struck the marker 3 cm. above the left orbital ridge. The wound of entry was 2½ cm. in length, and from ½ to 1 cm. in width, the edges were jagged; there was no wound of exit. The man died on the third day. At the post-mortem examination the bullet track was found to have passed obliquely through both halves of the cerebrum. The bullet was found with its point flattened lying in the right posterior fossa of the skull. In another case during field firing a marker looked out from his shelter and was shot in the back of the head with a "S." bullet at a range of 1,400 metres. The wound of entry was 1 cm. to the right of the occipital protuberance. The wound of exit was situated immediately above the left ear, and was of irregular shape, measuring roughly 2 by 2·5 cm., the surrounding bone was much comminuted. Death occurred in eight hours. The greater part of the occipital lobe was destroyed.

In a case of attempted suicide a man shot himself with a service rifle through the left lung, the wound of entry being 3 cm. below the left nipple, and the wound of exit at the lower angle of the left scapula. He recovered, and returned to duty in three months. The kind of bullet is not distinctly stated. During field firing a man was shot at a range of 150 metres, presumably with the "S." bullet. The wound of entry was the size of a florin, and situated between the sacrum and ilium, there was no wound of exit. He died in two hours. Post-mortem: the sacrum and ilium were much comminuted; there were three openings of the diameter of a millet seed in the appendix; the bullet was found much deformed in the peritoneal cavity.

Suicides.—There were 333 attempted suicides (= 0·6 per 1,000 of strength); of these 221 were fatal.

Deaths both in and out of hospital were as follows: Due to disease, 622 = 1·1 per 1,000 of strength; due to accident, 133 = 0·24 per 1,000 of strength; due to suicide, 221 = 0·4 per 1,000 of strength.

C. E. P.

Neo-Salvarsan.—Stuehmer (*Deut. med. Woch.*, May 23, 1912, p. 983) reports that he has treated 340 patients with 1,400 injections of neo-salvarsan, mostly intravenously (*vide* JOURNAL ROYAL ARMY MEDICAL CORPS, June, 1912), 0·9, 1·2, 1·35, and 1·5 grm. being given successively at intervals of one or more days. Hence it is seen that the doses used exceed greatly those of salvarsan. This appears to be the chief advantage of the preparation. Nevertheless, in cerebro-spinal cases the dosage should be reduced to 0·15, 0·35, 0·6, and 0·75 grm., with eight days between the injections. Nephritis, advanced arterio-sclerosis, myocarditis and pyrexia, are contra-indications. Neo-salvarsan is well borne. Col-

lapse, vomiting and diarrhœa are seldom observed immediately after its administration. Albuminuria has not been noted. Arsenic eruptions are frequent. They occur between the seventh and the twelfth days after the first dose. A papular or urticarial rash appears on the hands and face, which may be accompanied with fever, headache, lassitude, vomiting and diarrhœa. These symptoms disappear in a few days and do not recur on repeating the injections. To prevent these troubles it is advisable not to give the remedy from the seventh to the twelfth day after the first dose. The therapeutic action of neo-salvarsan is similar to that of salvarsan. The Wassermann reaction became negative in 82 out of 122 cases. If this test remains positive two or three weeks after the fourth dose, mercurial treatment should be commenced. The blood of three patients whose initial lesion was excised has remained negative from two and a half to four months after the course of neo-salvarsan. Gonorrhœa appears to be cured.

Bernheim (*Deut. med. Woch.*, May 31, 1912, p. 1,040) has treated twenty-nine patients with neo-salvarsan by giving every other day intravenous injections of doses which are equivalent to 0·6 grm. and 0·4 grm. of the old salvarsan for a man and a woman respectively. He observed severe reactions in four instances after the third and fourth injections. Headache, fever, rashes, prostration and slow recovery were noted in all. Nausea and diarrhœa occurred in two. He thinks that the treponema disappears more slowly than under "606." In all of seven cases the treponema was found on the day following the first dose, and in four it was still present on the second day. *Spirochæte refringens* was obtained on the tenth day after the end of the course from secondary lesions which had shown considerable resistance to the remedy. The Wassermann reaction was positive in the blood of ten out of eleven persons examined twenty-one days after the fourth dose. Bernheim considers that neo-salvarsan possesses certain advantages over its predecessor, but the intervals between the injections should be lengthened and mercurial treatment should follow.

Teuton (*Berl. klin. Woch.*, June 6, 1912, p. 1117) has given fifty injections of neo-salvarsan to twenty-six patients, twelve of whom were in the latest stage of syphilis, eleven with a positive and three with a negative Wassermann reaction. The others included cerebro-spinal lues, general paralysis, tabes, leucoplakia, primary and secondary lesions. The amount administered varied from 0·9 to 2·25 grm. in three weeks, No constitutional symptoms were noted, although eight of the recipients were between 40 and 70 years of age. Considerable improvement occurred in the tabetic, and the paralytic patients were not made worse. Teuton insists on the importance of using germ-free water. He also employs mercury and iodides. C. B.

Treatment of Heat-stroke.—Dr. L. Chastang, Médecin en Chef de la Marine (*Le Caducée*, March 16, 1912), discusses the treatment of heat stroke, of which he has had a large experience among cases occurring on board ship in the Tropics. Chastang states that in these cases death is due to cardiac and respiratory failure. In his earlier cases he used cold applications to the body, but was not satisfied with the immediate effects, and in some of the cases pulmonary and hepatic congestion resulted.

Believing that in heat stroke the cardiac and respiratory centres in the medulla do not act efficiently and require to be stimulated, he adopted a hot bath treatment. When a patient is brought to hospital in an unconscious condition due to heat stroke, Chastang puts him into a bath at a temperature of 100°F., which is gradually raised to 105°F. or 108°F. in bad cases. The patient is kept in the bath for about ten minutes, during which time cold is applied to his head and the precordial region is rubbed or flipped with a wet towel. The effect of plunging the patient into the hot bath is rapidly to restore him to consciousness; when his pulse and respiration have become regular he is lifted out of the bath and placed naked on a bed while the attendants fan him. The patient usually falls into a calm sleep, during which, however, he must be watched. A great advantage of the hot bath treatment is that there is no subsequent liability to visceral congestion. C. E. P.

A New Diet for Typhoid Fever, with Notes.—By Surgeon W. M. Garton, U.S. Navy. (Extract from *The Military Surgeon*, No. 3, March, 1912). "The dietetics of typhoid fever, and its results having been so remarkably successful at this hospital (Norfolk, Va.) in the past two years, and especially so during the recent, and one of the most acute, epidemics the Navy has experienced (at one time sixty-five acute cases were under treatment) has caused me to submit the following report:—

* * * * * *

"The first step was the elimination of milk; a milk-free diet having greatly impressed me from the reports of Dr. Lambert, of New York City. The results were very good indeed, and I decided to try and satisfy myself why such was the case.

* * * * * *

"I concluded that a minimum nitrogenous diet was what was indicated, and the results have justified this conclusion.

"A menu was formulated, consisting principally of carbohydrates and fats that would meet the requirements of a minimum nitrogen equilbrium.

"The following table is the complete diet given in twenty-four hours with notes, method of feeding, &c. It is the result of over two years' work, and has been changed many times due to the valuable suggestions of the medical officers who have been in charge of the typhoid fever ward during that time.

"The use of Robinson's barley and Bethlehem oats was due to the excellent results obtained in the feeding of infants, and its adoption in typhoid feeding has not been disappointing, but to the contrary has given excellent results.

"The interval may be increased to three hours, and, if necessary, the amount can be reduced, but the patient should be urged to take as much as possible.

"Begin diet about 6.30 a.m. Interval between feeding, two hours.

"6.30 a.m.: One cup hot coffee with two drachms sugar, no cream; two slices of zwieback or buttered toast.

"8.30 a.m.: One portion of Jordan's Bethlehem Oats or Robinson's Patented Barley, according to bowel indications, with six buttered crackers, saltines.

"10.30 a.m.: Six ounces of soup; change recipe occasionally.

"12.30 p.m.: One medium baked potato, mashed and prepared with an ounce of butter, add large pinch of salt; two thin slices of buttered toast, hot, and one cup hot weak tea with two drachms of sugar.

"2.30 p.m.: Two teaspoonfuls of pudding, bread or tapioca, preferably the latter, and six saltine crackers.

"4.30 p.m.: Two ounces of rice, farina or cream of wheat, thoroughly mixed with one ounce of butter and four drachms of sugar; change from day to day to alter diet.

"6.30. p.m.: Three slices of buttered toast.

"8.30 p.m.: Six ounces of soup.

* * * * * *

"All soups to be strained through a fine sieve.

"The patient should be fed with an 'Ideal' feeding cup or spoon, and the food should be given slowly. Don't hurry the patient. Give water between meals. Give nitrogenous nutriment as soon as the convalescence is established, beginning with liquid beef peptonoids, panopepton, buttermilk, &c.

"At the height of the fever, if these foods are distasteful or if the patient cannot eat the full quantity, reduce amount and add milk sugar in considerable quantity.

* * * * * *

"Orange and lemon ices can be given when ordered.

"A special diet kitchen has been installed in which this typhoid fever diet is cooked, and great care is taken in its preparation and to see it is served in a way that will not be repulsive, but tempting to the patient. This diet kitchen is under the supervision of a nurse especially detailed for this duty.

* * * * * *

"In concluding, I wish to state that 175 typhoid fever cases have been treated at this hospital in the past two years with a record of five deaths. These cases on admission represented all types and stages of the disease, and cannot be considered selected ones. As a general rule, the fever has been moderate, nervous symptoms absent, hæmorrhage in less than ten cases, and perforation of the bowel in one case, flat abdomen the rule, marked loss of flesh the exception, and a craving for food rather unusual. When the patient is able to get up, his general appearance does not present the usual striking picture of emaciation, and he rapidly regains all his strength and is ready for duty as soon as three negative stools have been obtained. Relapses and secondary infection have occurred in a very few cases."

Treatment in Typhoid Fever.—By Surgeon Charles P. Wertenbaker, United States Public Health and Marine-Hospital Service (Extract from *The Military Surgeon*, No. 3, March, 1912).

* * * * * *

"The results following the feeding of milk only were good in my own practice, and I recall having lost very few cases. Some fifteen years ago it was brought to my attention that milk is an excellent culture material for typhoid bacilli, so I abandoned the practice of giving milk to typhoid cases, and substituted a diet of orange juice alone, and since that time my treatment of typhoid has been about as follows:—

"On commencing the treatment usually a dose of castor oil is given, combined with some of the aromatics, for the purpose of clearing out the bowels. Nothing in the way of food is given excepting orange juice, of which the patient is allowed as much as is desired. Usually a pint or more of the juice is consumed in twenty-four hours. The juice is squeezed from the oranges, strained, and given cold. Patients generally like it, and do not tire of it as they did of a milk diet. The patient is encouraged to drink water freely, and is given tea freshly made, when desired.

"Little or no medicine is given; an occasional dose of turpentine emulsion, or assafœtida is given if tympanites is present. Lately I have been giving 10 drops of dilute hydrochloric acid three or four times a day. I usually use strychnia as a heart stimulant. The lower bowel is washed out by an enema once or twice daily. A sponge bath is given whenever the temperature reaches 103° F., but this is seldom necessary. I have never used the tub bath to reduce the temperature in typhoid, as I have never found it necessary. The patient and his discharges are carefully screened against flies.

"Under this treatment the disease runs a regular course, the temperature seldom rising above 103° F., and but few complications have developed. The tongue remains fairly clean, that is to say, it is seldom that one sees that thick creamy coat on it, and sordes gathering on the teeth and lips. The abdomen is usually flat, denoting the absence of gases in the bowels. The temperature usually returns gradually to normal about the twenty-first day. When the temperature has remained normal for forty-eight hours, the tongue clean, and the red edge at the tip has disappeared, I allow the patient one soft boiled egg, with a cup of tea or coffee. The egg is put in a cup, boiling water poured over it, and it is allowed to remain for ten minutes. This thoroughly cooks the egg, but the white remains soft. The patient is carefully watched through the day, and if no unfavourable symptoms arise two such eggs are given three times during the next day, and thereafter the diet is gradually increased, adding crackers, hominy, mashed potatoes, milk, toast, &c., until at the end of a week, or ten days, the patient is on a restricted solid diet."

Syringes in Army Medical Equipment.—Oberstabsarzt v. Tobold (*Deut. Militärärzt. Zeit.*, January 5, 1912), who is in charge of the Army Medical Stores, Berlin, has been investigating the different syringes which are included in the army medical equipment, with a view to finding the most serviceable form, and of reducing the number of patterns at present in use. The report is somewhat full, but the following points are of interest.

Hypodermic Syringes.—(1) Glass with leather plunger. If the leather is saturated with acid-free soft paraffin (not with oil) the syringe will remain ready for use for five to six weeks, and can be soaked in alcohol without suffering. If ether is used in the syringe the vaseline is gradually dissolved out of the leather, and the plunger will not fit the barrel closely. The syringe need not be boiled to sterilize it, rinsing with 55 per cent alcohol is sufficient. v. Tobold concludes that this syringe is the one most suited to army medical requirements in the field. On the question of sterilizing the syringe by boiling before using it the opinion generally expressed was that this need only be done when the syringe has been in contact with infective material.

The all-glass syringes were found to be too liable to break, especially so when being boiled; they must also be taken to pieces and carefully cleansed after use, otherwise the piston is liable to jam.

The all-metal syringes are not suitable because it is impossible to see what is taking place in the barrel.

A number of syringes made of glass and hard rubber compounds were experimented with. None of these were found to be satisfactory.

Ear Syringe.—For use in hospitals a new pattern of ear syringe has been introduced. The barrel is of glass, the metal fittings have been made of lighter material, and two curved rods have been substituted for the finger rings; the weight has consequently been reduced to nearly half of that of the former pattern. C. E. P.

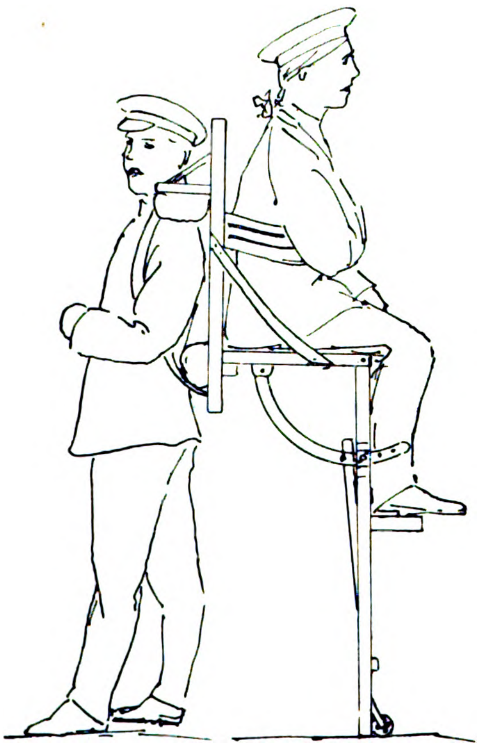
The Command Voice.—Stabsarzt Dr. Zumsteeg (*Deut. Militärärzt. Zeit.*, January 20, 1912) has written a paper on affections of the voice when used for giving commands in military life. He points out that the "command voice" is exactly an octave higher than that usually employed in conversation. This demands greater approximation of the vocal cords and a more powerful expiratory effort, thus throwing considerable strain on the vocal cords. When persisted in for any length of time a hyperæmia of the larynx with hoarseness and loss of voice is produced. In order to cure this condition the voice must be rested for several weeks while Schreber's breathing exercises are practised and faradization applied to the larynx. The medical officer has to determine the natural pitch of the particular voice for talking; the command voice is one octave higher and this must be practised till the person becomes habituated to using the proper pitch when giving commands.

Zumsteeg would like to have the following points impressed on all persons whose duty necessitates the frequent use of a command voice; (1) Before giving a command a deep breath should be taken. (2) The word of command should begin softly, *i.e.*, not with a sudden explosive opening of the vocal cords. (3) By using a high pitched voice the command is more distinctly heard, but this should not give rise to a feeling of strain. C. E. P.

A New Sick and Wounded Transport Apparatus.—By Friedrich Engelhardt, Section Commander in the Voluntary Aid Column of the Red Cross at Erfurt (*Das Rote Kreuz*, March 17, 1912). The apparatus is a folding carrying chair on which a single bearer can carry a sick or wounded person for a considerable distance. One bearer carried a load of 170 lb. in eleven minutes for a distance of about 900 metres without setting down, while the ordinary stretcher with 4 bearers was left nearly 300 metres behind. The weight is 23 lb. A supply of dressings is contained in the padded shoulder rest.

The construction of this apparatus is not altogether clear, but an inspection of the diagram shows that it consists essentially of a chair which is supported on the bearer's back by means of padded shoulder pieces, and when the bearer stoops forward, as he does in carrying the chair, the weight is divided between his shoulders and his loins, where another padded cross-piece is provided. The straps through which the bearer puts his arms seem to be attached to the upper and lower bars of the frame of the chair back.

The patient is kept from slipping off by a band or bands, which pass from the chair back frame round his abdomen. Diagonal straps pass from the back to the seat of the chair to prevent slipping and possibly also as an additional strengthening to the seat.



The seat appears to be hinged to the back of the chair, in such a way that it can be folded up. The seat of the chair has attached to its front bar a frame carrying a foot rest; the frame can be adjusted by iron arcs, at varying angles with the chair seat. The frame has its side limbs of such a length as to be able to support the chair by resting on the ground when the bearer stands erect. There appears to be a secondary frame carrying rollers, the use of which is not understood.

The construction is elaborate, but there is no doubt that under certain circumstances an apparatus which is so portable, and on which one patient can be carried by one bearer, has considerable merit.

The principle is well known in mountainous countries where all weights are carried somewhat in this way. H. E. R. J.

Course of Instruction for Delegates of Voluntary Aid Societies (*Deut. Militärärzt. Zeit.*, March 5, 1912).—The course was held in the

Kaiser Wilhelm Akademie in Berlin, from February 5 to 9, 1912, and was attended by 178 delegates belonging to the Order of St. John, the Sovereign Maltese Order and the Red Cross Society. The Director-General of the Army Medical Service opened the proceedings with an introductory speech. The following are some of the lectures and demonstrations which were given by the staff of the Kaiser Wilhelm Akademie and General Staff of the Army:—

The organization of the Army Medical Service in the field; personal equipment for voluntary aid delegates on the lines of communication and the preparations which should be made by voluntary aid societies in anticipation of mobilization; pictures showing different phases in the care of sick and wounded in former wars; a practical illustration showing the sphere of usefulness of voluntary aid, with explanations of military situations, orders, reports, sketches, &c.; the development of the voluntary aid movement in Germany, its incorporation in the Regular Army Medical Service and the responsibility of delegates. At the Army Medical Stores the field equipment of the Medical Service was demonstrated to the delegates. A complete clearing hospital was pitched and equipped at Spandau in order to let the delegates grasp all the details connected with this work.

At the end of the course the delegates and instructors were entertained at dinner in the Kaiser Wilhelm Akademie. C. E. P.

Battle Losses in the Russo-Japanese War.—The following tables have been constructed from the figures given in Tables VIII and IX, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, vol. xviii,[1] pp. 337, 338, with the object of trying to ascertain what the daily proportion of casualties would be in a modern battle. In taking the Russian figures it must be remembered that in none of the battles were the Russian arms victorious, and the proportion of missing is, therefore, in all probability unduly high. I have not been able to obtain reliable figures for the Japanese forces; these would have afforded a valuable comparison.

On glancing down the column of total losses per 1,000 of strength one is struck by the great differences shown in different battles. Speaking generally, the result seems to be that the shorter the battle the heavier the daily casualties. This probably means that in prolonged battles both sides became more or less wearied and had to rest at intervals; during these periods practically no casualties would be taking place, so that the daily average for the whole battle would naturally be lowered.

Taking four of the prolonged battles we get the following results:—

Battle	Strength	Days of fighting	Average daily loss per 1,000 of force engaged			
			Killed	Wounded	Missing	Total
(1) Yanzelin	71,000	14	0·68	2·8	0·7	4·2
(2) Liao Yang	261,470	8	1·0	6·4	0·7	8·1
(3) Shaho	358,170	11	1·3	7·7	1·2	10·2
(4) Mukden	374,345	20	1·2	6·8	3·8	11·8

[1] Statistical data concerning the losses of the Russian Army from sickness and wounds in the War against Japan, 1904-1905.

Average number of casualties per 1,000 of strength which occurred in each day of fighting, 8·3.

In contrast to these, at the two battles of the Ya-lu and Nan Shan, where the Russian forces engaged were small (11,718 and 12,420 respectively), and were outnumbered roughly three to one by the Japanese, the casualties were:—

Battle	Strength	Days of fighting	Average daily loss per 1,000 of force engaged			
			Killed	Wounded	Missing	Total
(1) Ya-lu	11,718	2	25·3	90·5	20·4	136·2
(2) Nan Shan	12,420	1	14·5	67·3	48·0	129·8

Average number of casualties per 1,000 of strength which occurred in each day of fighting, 133·0.

Other Battles :—

Battle	Strength	Days of fighting	Average daily loss per 1,000 of force engaged			
			Killed	Wounded	Missing	Total
(1) Wafangou (To-li-ssu) ..	36,284	2	7·8	32·3	9·0	49·1
(2) Kuan-tung..	38,325	3	1·9	9·6	1·9	13·4
(3) Tashichao	26,984	2	2·7	14·5	2·1	19·3
(4) Feng-huang Shan ..	22,250	1	6·8	18·6	4·2	29·6
(5) Lang-tzu-shan	28,715	3	1·0	7·4	0·3	8·7
(6) An-ping	27,850	1	10·6	49·2	6·4	66·2
(7) Sandepu	103,742	5	3·3	21·4	2·1	26·8

Average number of casualties per 1,000 of strength which occurred in each day of fighting, 30·4.

The average of the daily losses for all the thirteen battles was 39·5.

The evacuation problem is only concerned with wounded.

Taking the four battles in the first table, we find that the average number of wounded per 1,000 in each day of fighting was 6; in the two battles of the second table it was 79; in the seven battles of the third table it was 22·0; while the daily average of the whole thirteen battles was 25·7.

Unfortunately, for the purpose of calculating the amount of transport required for wounded after a battle these figures are of little value. We do not know whether the strength includes only the troops actually engaged, or embraces all troops within the sphere of fighting; there is no information as to the incidence of casualties in particular Army Corps or Divisions, or as to whether the casualties happened mainly on one or more days, or were fairly evenly distributed over the whole period of fighting; no indication is given as to the kind of transport which would have to be provided.

At the battles of the Ya-lu and Wafangou, the Japanese losses were stated to be very much lower than those of the Russians; at the remaining

battles the ratio of losses to strength appears to have been approximately equal, so far as figures for the Japanese Army are available.

C. E. P.

Austrian Red Cross Society.—The following notes are taken from a speech by His Excellency Surgeon-General Ritter von Uriel, Privy Councillor, late Director-General Austrian Army Medical Service (*Das. Rote Kreuz,* No. 1, 1912). After tracing the history of the Red Cross movement in Austria, and recapitulating the occasions on which the Society has afforded assistance to belligerents, he proceeded to give a sketch of its resources for war and its work in peace.

I.	War Funds £417,870	(*a*) Central Red Cross Society	£147,610
		(*b*) Austrian Patriotic Society	42,040
		(*c*) Other affiliated Societies	100,570
		(*d*) Branches of the Society	127,650
II.	Funds allocated for special purposes		140,685
III.	Peace Funds...		24,010
IV.	Value of equipment, stores, &c.		72,000
V.	Value of buildings		81,260

The total capital in cash and property belonging to the Red Cross and affiliated societies amounted to £735,825. About two-thirds of this total has been provided by members' subscriptions and the interest on investments. Of the remaining one-third more than half has been derived from the proceeds of lotteries; about a quarter belongs to the Austrian Patriotic Society, and the balance has been derived from Government subventions, gifts, legacies, &c.

As regards the employment of these funds, the war funds shown in Section I constitute a reserve for war purposes. The £147,610 belonging to the Central Committee of the Red Cross Society is intended to cover expenditure in rendering assistance to the Army Medical Service at the front and on the lines of communication, and for expenses in connection with the Central Information Bureau. The sums shown in the other three sub-divisions would be expended in the home territory in the provision of hospital accommodation, convalescent homes, rest stations, &c.

The funds in Section II are mainly allocated for the provision of pensions to soldiers incapacitated by war, to widows and orphans of soldiers who die or are killed in war.

The Peace Fund shown in Section III was not established till 1891.

As regards the values shown in Section IV and V, two per cent per annum is written off for depreciation. In addition to this £13,260 was struck off, representing the cost of first field dressings which had become obsolete, and of first field dressings which the Red Cross Society supplied free of charge to the Army.

The Society's headquarters cost £12,250, and the depot for transport vehicles £12,720.

Resources for war are as follows:—

A. In the zone of active operations and line of communication.

(1) 1,356,120 first field dressings. These are prepared by the military medical authorities and supplied at cost price to the Society, which on mobilization provides a first field dressing for all persons in military employ.

(2) Thirty-five stores wagons with their loads complete. Some of these are placed at the disposal of the D.M.S.s of Army Corps, others are allotted to the Society's medical stores depots on the lines of communication.

(3) 495 ambulance wagons, each with 8 military stretchers, for 99 field hospitals (5 wagons to each).

(4) Two Red Cross field hospitals, each accommodating 200 sick, with 10 ambulance wagons.

(5) Fourteen sets of equipment for mountain medical units, each with 6 hill carts, 1 pack animal load of medical and surgical stores, and 10 stretchers.

(6) Three Red Cross Society's mobile depots; these usually form a section of an advanced depot of medical stores. The stores are packed in about 1,000 cases, and 50 covered wagons have been provided for transport. Three up-to-date equipped Röntgen-ray wagons are included in the depots.

(7) Three hospital ships, accommodating altogether 750 sick. The fittings for two of these ships are stored in Trieste. The equipment for the third ship, if required, will be provided by His Highness Prince Fürstenberg.

With the exception of medical comforts and rubber articles the whole of the equipment enumerated above is in store and ready for immediate mobilization.

B. In the home territory:—

(1) Thirty-nine Red Cross reserve hospitals, capable of accommodating 226 officers and 7,977 other ranks.

(2) Beds have been promised in civil hospitals for 249 officers and 1,943 other ranks.

(3) Nineteen Red Cross non-dieted hospitals to accommodate 39 officers and 502 other ranks.

(4) Twenty-five convalescent homes with accommodation for 52 officers and 956 other ranks.

(5) Private homes with attendance. Accommodation for 4,170 officers and 12,178 other ranks have been voluntarily offered to the Red Cross Society.

The Red Cross Society can thus undertake the care of 475 officers and 9,920 other ranks who are seriously ill or badly wounded, and require treatment in hospital (1) and (2); in addition to this the Society is prepared to take over 4,261 officers and 13,641 other ranks who are convalescent and not in need of skilled nursing (3), (4) and (5).

The medical personnal provided for the above duties is: 259 doctors, 47 pharmacists, 59 storekeepers, 637 sisters belonging to religious orders and 457 trained nurses.

(6) Fifty railway rest and refreshment stations, capable of dealing with 50 officers and 5,064 other ranks.

(7) The Central Information Bureau, which provides, free of charge, information as to the condition of sick, wounded and prisoners.

In Peace.

(1) Eighteen emergency depots. The Society possesses 87 hospital huts, each accommodating 12 to 15 sick; 62 of the huts are completely equipped. On the request of the Imperial sanitary authorities these huts

are lent to districts in which an epidemic occurs, a privilege which has been gratefully accepted on many occasions. These huts would also be available if required during war.

(2) Thirty steam disinfectors; these are for loan with the hut hospitals and during epidemics.

(3) On several occasions grants of money have been made to relieve sufferers in civil calamities.

(4) Ambulance detachments, to render first aid and to transport sick have been organized in many localities. Some of these also undertake disinfection work. These detachments would also be capable of affording considerable assistance during war,

(5) A large number of emergency dressing packets have been supplied to the gendarmerie, and have proved of great value in country districts.

(6) Resident schools for nurses. The Red Cross Society has six homes in which pupils reside under the care of a matron and where they receive theoretical instruction. Practical instruction is given in the nearest civil hospital. Although intended to produce a reserve for war the services of these nurses is very much appreciated by the civil population, especially in Bohemia.

(7) Courses of instruction in nursing. These are being held in the civil hospitals of all the principal towns. C. E. P.

The National Importance of the Red Cross Societies of Germany.—Extract from a lecture by von Knesebeck to the Red Cross delegates in February, 1911. (*Das Rote Kreuz*, No. 5, 1912, p. 138.) In 1870 Germany received from European countries £133,500, and from America £165,000, in addition to material and personnel for the assistance of those injured in war.

The Red Cross movement in Germany began in 1863. At the present time the property of the Central German Red Cross Committee is valued at £256,370 and that of the Prussian Society at £128,350. There are 1,650 organized voluntary aid detachments with 1,850 medical officers. The property of the Ladies' Patriotic Society (Vaterländische Frauenverein) is valued at £1,177,850. In addition there is a separate Red Cross organization in each State.

The Red Cross societies do valuable work in peace time, especially in combating tuberculosis and other infectious diseases. C. E. P.

Simulated Deafness.—Dierickx (*Archiv. méd. Belges*, November, 1910) in an article on this subject, after briefly reviewing the tests usually employed for the detection of aural lesions proceeds to describe how feigned unilateral deafness may be detected.

Before beginning the examination the subject's eyes should be bandaged to prevent him from watching the examiner's movements.

(1) The sound ear is plugged. The defective ear is then tested by noting the exact distance at which the ticking of a watch ceases to be heard. This test should be repeated on several occasions, and any marked alteration in the distance noted.

(2) If the ears are plugged a loud voice or metallic sound can still be heard by a normal person at a distance of 7 to 10 ft. The malingerer is first tested at a distance of 10 ft.; his ears are then plugged and the test repeated, when he will usually say that no sound is audible.

(3) Another test depends on the application of Weber's test. A large tuning-fork is set in vibration, and the hearing of both ears tested. The sound is of course heard best in the unaffected ear. The tuning-fork is then placed on the forehead. If there is any interference with the mechanism of conduction in the middle ear the sound is heard best on the affected side; a malingerer will nearly always say that he hears it better on the unaffected side, or that he cannot hear anything. If the sound ear is then plugged and the test repeated, a man whose hearing is really deficient in one ear will hear better with the ear which has just been plugged; a malingerer on the other hand usually says that he cannot hear anything at all.

(4) If Rinne's test is employed a malingerer will usually say that he fails to hear the tuning-fork when it is placed on his mastoid process.

(5) One tube of a binaural stethoscope is tightly plugged, without the knowledge of the person to be examined; the stethoscope is then placed in his ears, the plugged tube leading to the sound ear; a sentence is then read out to him and he is asked to repeat it; if he does so he must have heard it with the defective ear.

(6) A solid plug is shown to the malingerer and he is told that it will be used for testing his hearing; a similar but perforated plug is then placed in the sound ear. A malingerer will usually say that he cannot hear anything. He is then shown the plug, the perforation being pointed out, and is told that the test will be made again. On the second occasion the solid plug is placed in the sound ear. If, as is probable, he now hears well, it must be with the defective ear.

C. E. P.

The Cause of Arterio-sclerosis.—Saltykow (*Münch. med. Woch.*, October 17, 1911, p. 2,232) thinks that arterio-sclerosis is most frequently caused by some infective process. The actual species of the exciting micro-organism is of no great significance if we can rely on animal experiments. Next come chemical poisons, of which alcohol holds the first place. The beginning of arterio-sclerosis often dates from youth, though its evil effects may not be apparent until late in life.

C. B.

Correspondence.

MOBILIZATION OF FIELD MEDICAL UNITS.

TO THE EDITOR OF "THE JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

Sir,—In a lecture on "The Mobilization of Field Medical Units," published in the May number of this Journal, there oocur some statements which are not in accordance with the Regulations for Mobilization, nor with the procedure which would be carried out. As it is desirable that there should be a clear understanding on this important subject, I venture to draw attention to these. I take them in the order in which they occur. For definition of a unit see para. 2, Regulations for Mobilization.

Matériel.—Under the heading "*matériel*" it is stated that the special articles—namely, Wolseley helmet, brassard, field dressing, &c., are obtained by the company. This is not the case, as they are stored with the Mobilization Equipment of the unit and would be drawn by it (para. 111, Mobilization Regulations, and para. 4, Clothing Regulations, Part III.). The same remark applies to waterproof sheets and blankets which are on the mobilization store table of a unit, and must therefore be drawn by it. Emergency food is not issued by the company but by the unit (para. 116, Mobilization Regulations).

Duties of Officers Commanding a Company of the Royal Army Medical Corps.—"Recall all on leave." This has since been altered; it is now only necessary in the case of a partial mobilization (para. 197, Mobilization Regulations).

"Render Army Form D. 418 (Separation Allowance)" and "Render Army Form O. 1796 (Allotment of pay)." These should be rendered by the unit in whose pay the soldier will be—i.e., by the officer commanding the unit formed on mobilization.

Verification of entries in A.B. 64. This is the duty of the officer commanding the unit (para. 213, Mobilization Regulations and A.O. 33(4) of 1906).

"Draw supplies and issue emergency food." This could not possibly be carried out by the officer commanding the company. They are part of the war outfit of a field or line of communication unit and would only be issued to it (paras. 17, 115, and 116, Mobilization Regulations).

"Draw and issue the special articles, &c." These duties are carried out by the officer commanding the unit. See previous remarks under heading "*matériel*."

In the suggestions for facilitating mobilization it is assumed that "as is usually the case a company of the Royal Army Medical Corps has to furnish personnel for several field units who are all mobilizing in the close vicinity." A reference to Table III, Mobilization Instructions, Army Medical Service, will show that the place of mobilization is very often at a distance or even in another district from the company which provided the personnel.

Duties of the Officer-in-Charge of a Field Medical Unit on Mobilization being Ordered.—It is stated that this officer should proceed to the headquarters of the company of the Royal Army Medical Corps, and having collected any available personnel should proceed with them to the place of mobilization.

According to para. 144, Mobilization Regulations, it is his duty to proceed at once to the place of mobilization to take command of the personnel who report there for duty.

I am, &c.,
T. P. Jones,
Major, R.A.M.C.

Woolwich,
June 10, 1912.

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Journal

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Royal Army Medical Corps.

Original Communications.

JOHN HUNTER, F.R.S., SURGEON-GENERAL AND INSPECTOR-GENERAL OF HOSPITALS.

BY MAJOR H. A. L. HOWELL.
Royal Army Medical Corps.

IT is with considerable diffidence that the writer publishes this outline of the life of John Hunter. Many excellent biographies of this eminent surgeon exist and are readily accessible. The writer is therefore obliged to beg the indulgence of his readers on the plea that no series of military medical biographies could be complete unless it included an account of the life of this remarkable scientist, who was for a time a Staff-Surgeon in the Army on active service in the field, and, later on in life, the head of the Army Medical Department.

John Hunter, the youngest of the ten children of John Hunter, was born on February 13, 1728, at Long Calderwood, in the parish of East Kilbride, Lanarkshire. The Hunters belonged to an old Ayrshire family, and John's mother was the daughter of the Treasurer of the City of Glasgow. When a boy, Hunter was allowed to neglect school, and he never afterwards overcame the defects of his education. He loved out-door sports, and even in those early days took an intense interest in natural history. His father died in 1741, and four years later, when 17 years of age, John Hunter went to Glasgow to live with a sister who had married a cabinet-maker. He worked at this trade for three years, but also, according to one authority, studied natural philosophy at

Glasgow University in 1745. In 1748 he rode to London to visit his brother William, who put him to work at once in the dissecting room on the dissection of an arm. He took so kindly to the study of anatomy that in the second season he was able to superintend his brother's pupils. At this time he was of a jovial disposition, and was known familiarly as "Jack Hunter." He was fond of lively company and the theatres, and was very popular with the "resurrection men," who provided the subjects for dissection. In the summer of 1749 he began to attend Chelsea Hospital, where the great surgeon Cheselden gave instruction. In 1751 he studied at St. Bartholomew's under Percival Pott, and in 1753 was appointed one of the "Masters of Anatomy" of the Surgeons' Corporation. He entered as a surgeon's pupil at St. George's Hospital in 1754, and was house-surgeon there for five months in 1756. His defective education led him to matriculate at St. Mary Hall, Oxford, on June 5, 1755, but apparently he only stayed in Oxford about three weeks, although his name was on the books till October, 1756. Speaking of this time at Oxford he afterwards declared "They wanted to make an old woman of me, or that I should stuff Latin and Greek." He began to teach anatomy in William Hunter's School in 1754, and, according to the *European Magazine*, his brother wanted to take him into partnership in 1755. He declined partnership owing to his extreme diffidence as a public speaker, but continued to assist his brother.

During this period of his life Hunter traced the descent of the testis in the fœtus, made some discoveries as to the placental circulation, studied the nature of pus, inquired into the absorbing powers of veins, investigated the olfactory and nasal nerves, and with his brother did a great deal in elucidating the course and functions of the lymphatic system. The brothers were in the habit of showing their dissections and experiments to their pupils and friends before publishing the results of their work. This led afterwards to much controversy as to the priority of discovery of new facts, and even brought about a quarrel between the two brothers which ended only on the death-bed of William.

In 1759, John had an attack of pneumonia which obliged him to leave London for a time, and his brother's influence with Adair, the Inspector-General of Hospitals, obtained for him an appointment as Staff-Surgeon in the Army in October, 1761. Hunter's letters to his brother show that at first he was not satisfied with his position in the Army, and was anxious to get his commission, as by doing so he became entitled to pay at the rate of £1 a

day, and half-pay at 10s. a day. It was as Staff-Surgeon that he accompanied the Expedition to Belleisle, under Commodore Keppel and General Hodgson, in 1761. John Hunter's experience of active service was confined to this expedition, and to about a year with the British troops in Portugal. These expeditions are now forgotten and practically nothing can be gathered concerning them in any biography of John Hunter. The writer thinks, however, that military readers may be more curious as to what Hunter's war experiences really amounted to, and has collected a few notes from contemporary sources on the subject. Briefly, the expeditionary force consisted of about 8,000 men, ten ships of the line and other vessels. It sailed from Spithead on March 29 and arrived before Belleisle on April 7. The coast was rocky and precipitous, and the first attempt at landing at Lochmaria Bay was disastrous. The total casualties amounted to 434; of these 94 officers and men were killed, 74 wounded, and 265 taken prisoners. A landing was not effected until April 25, and the town of Palais was then besieged. The French made a good defence. On May 13 the town was taken by assault, and on June 7 the citadel surrendered on honourable terms. The English losses during the short campaign amounted to 284 killed and 501 wounded. Great sickness afterwards broke out amongst the British garrison. In October there were fourteen hospitals established in the town of Palais, and others were being constructed. There were also regimental hospitals in different parts of the island, particularly at Sauzon and la Maria, where at each place a brigade was quartered. The disease was described as "a severe fever and flux," probably enteric fever. It is of interest to note that one of those present wrote: "Clarified butter, given two spoonfuls at a time, twice or thrice a day, is an infallible cure for the bloody flux." Some of the troops were brought back to the Isle of Wight in the latter part of the year. The Staff-Surgeons were probably at Palais where the chief hospitals were. In 1762 Hunter proceeded to Portugal, returning to England in the following May. Hunter did not stop his scientific investigations while on active service, for he tells us that when off Belleisle he was studying the coagulation of the blood; it was here and in Portugal he acquired his knowledge of gunshot wounds and inflammation. He continued his studies of human anatomy and inquired into the physiology of hibernating animals. He brought back with him "two hundred specimens of beasts, lizards, and snakes, the foundation of the present museum."

In Portugal, Hunter does not appear to have been happy in his

relations with his brother officers. His rude, brusque manner may have had something to do with this. A rival contemporary, Jesse Foot, who wrote a life of Hunter, says he was contentious and quarrelsome, and that on one occasion a colleague drew his sword upon him.

On his return to England Hunter went on half-pay, and this appears to have been his chief source of livelihood for some years. He was on half-pay thirty-four years. He started in practice in Golden Square, and formed a private class for anatomy and operative surgery. He also took resident pupils. He continued his studies in comparative and human anatomy, and arranged to get for dissection the bodies of all animals dying in the menagerie at the Tower. He also bought rare animals and allowed them to be exhibited on condition that he got their carcases at death. As soon as he collected ten guineas in fees it went on some addition to his collection. He once borrowed five guineas from the King's Bookseller, Nichols, to buy a dying tiger.

In 1764 Hunter bought two acres of land at Earl's Court, on which he built a house. Here he continued his dissections, had cages for living animals, kept bees, and made experiments in the artificial formation of pearls in oysters in a pond in his garden. He was very fond of fierce animals. On one occasion two leopards got loose, but he contrived to get them back into their cages although he was unarmed. Once a little bull, given him by Queen Charlotte, knocked him over.

John Hunter sent his first communication to the Royal Society in 1766. It was an anatomical description of a siren from South Carolina. He was elected F.R.S. on February 5, 1767. In 1767 he ruptured his tendo Achillis, and his study of the process of repair led to the practice of tenotomy for the relief of deformities. In this year he became a member of the Surgeons' Corporation. On December 9, 1768, he succeeded Gataker as Surgeon at St. George's Hospital. His practice increasing, he was able to remove to the larger house in Jermyn Street, which his brother William had vacated. Here he took house pupils, who were apprenticed to him for five years at a premium of five hundred guineas. Amongst them was Edward Jenner. May, 1771, saw the appearance of the first part of his "Treatise on the Human Teeth." In July of this year he married Miss Anne Home.

In June, 1772, he contributed to the Royal Society a paper on "The Digestion of the Stomach after Death." Everard Home, Hunter's brother-in-law, who became his pupil in 1772, said that at that time the museum filled all the best rooms in the house.

In 1773 Hunter began to lecture on the theory and practice of surgery. His lectures were at first free, but later a charge of four guineas was made. We are told that Hunter never made a good speaker; he was at times incoherent and nervous, and was in the habit of taking laudanum to steady his nerves before a lecture. His classes were not large, but his pupils included Astley Cooper, Cline, Abernethy, Anthony Carlisle, and Chevalier. At this time he had his first attack of angina pectoris, from which he afterwards suffered so severely. In 1774 his income first reached £1,000. Next year he was able to engage a young artist, William Bell, to make drawings of his preparations. Bell lived with him until 1789, and then joined the East India Company as assistant surgeon. He died in 1792.

In January, 1776, Hunter became Surgeon-Extraordinary to George III. In the same year his sympathies with the Royal Humane Society caused him to produce his "Proposals for the Recovery of People apparently Drowned." In this year he read before the Royal Society the first of his six "Croonian Lectures" on muscular motion. The last was delivered in 1782. They were published after his death.

Suffering greatly from vertigo in 1777, in the autumn he went to Bath. There he met his old pupil Jenner, who diagnosed that Hunter was suffering from an organic affection of the heart. A paper which he read before the Royal Society in 1780, "On the Structure of the Human Placenta," in which he claimed certain discoveries concerning the placental circulation which his brother had already claimed in his book on the uterus, led to a heated controversy. The Royal Society did not print the paper on William Hunter's protest, and the two brothers were estranged until the elder lay on his death-bed.

In 1782, John Hunter obtained the skeleton of the Irish giant, O'Brien, who was 7 ft. 7 in. in height, by bribing the undertaker with £500. This skeleton appears in Sir Joshua Reynolds's portrait of Hunter now in the Royal College of Surgeons. In this year he became a member of the Royal Society of Medicine and of the Royal Academy of Surgery of Paris.

The lease of his house in Jermyn Street, expiring in 1783, Hunter bought the leases for twenty-four years of two houses, 28, Leicester Square, and a house in Castle Street, and the land between. He spent £3,000 in building a large museum for his collection on this ground. He lived in Leicester Square and carried on his anatomical work in the house in Castle Street.

His collections, which cost about £10,000, were taken to the new museum in 1785. His yearly income had steadily grown to £5,000, and was £6,000 before his death. His experiments at this time on the mode of growth of deer's antlers led to his discovery of the establishment of the collateral circulation by anastomosing branches of arteries. This discovery led him to tie the femoral artery of a patient suffering from popliteal aneurysm. The patient recovered in six weeks.

The year 1786 saw the appearance of Hunter's "Treatise on the Venereal Disease," and also of his "Observations on Certain Parts of the Human Œconomy."

In 1786 Hunter returned to the active list of the Army. On the death of Middleton he was promoted Deputy-Surgeon-General, and, on the death of Adair, in 1790, he became Surgeon-General and Inspector-General of regimental infirmaries. In conjunction with Sir Clifton Wintringham (Physician-General to the Forces since 1786) he became head of the Army Medical Department. In 1793, his colleague becoming unfit for duty, Hunter became sole head of the Army Medical Department. (He was in fact our first Director-General, although that title did not exist until Sir James McGrigor's appointment.) His pay was £1,200 a year (Foot). This year saw the outbreak of war with France, and on Hunter, therefore, depended the organization of the medical arrangements in connection with the armies assembled for service in Holland, on the west coast of France, and in the West Indies. This year also saw a great increase in the strength of our Army, with a corresponding increase in medical establishments. The labour in connexion with this must have fallen on Hunter's shoulders. Writing he detested, so that the vast correspondence which fell to him must have given him great trouble. One wise reform he instituted made him unpopular with the Physicians to the Forces, who were a favoured class. He made it a rule that no person could hold the rank of army physician who was not (or had not been) staff-surgeon, regimental surgeon, or apothecary to the Forces. This gave to all surgeons and apothecaries the prospect of promotion to the better paid appointments. This regulation was upset by the Army Medical Board which was established after his death, but it was the first step towards the breaking down of the monopoly held by the College of Physicians and the Universities of the appointment of Physician to the Forces. We gather, from the diatribes of such of his contemporaries as Jesse Foot, that Hunter, as head of the Army Medical Department, showed no favour, but with a single mind did the best in his power for the good of the Service.

In 1787 Hunter received the Copley medal from the Royal Society on account of his discoveries in Natural History.

In 1792 Everard Home (then Assistant Surgeon at St. George's) undertook the delivery of Hunter's lectures in surgery, with the aid of Hunter's notes. Most of Hunter's spare time was now given up to the completion of his great work on "The Blood, Inflammation, and Gunshot Wounds," which was not published until after his death. In 1792, a dispute over the appointment of a surgeon at St. George's, in succession to Charles Hawkins (Hunter's candidate, Home, failing to get the appointment), caused Hunter to refuse to share the fees from his pupils with the other surgeons, on the ground that they failed to give proper instruction. Without consulting Hunter the surgeons and a committee made regulations forbidding the admission of pupils without previous medical instruction. Two Scotsmen appealed to Hunter for admission, and he undertook to bring the matter up at the next Board meeting. On October 16, 1793, the Board met, and while Hunter was speaking one of his colleagues (said to be Gunning) flatly contradicted him. Hunter stopped and went into another room, where he fell dead into the arms of Dr. Robertson, one of the physicians.

An autopsy showed organic disease of the heart, with calcification of the coronary arteries and of the mitral valve.

Hunter was buried in the vaults of St. Martin-in-the-Fields on October 22, 1793. On March 28, 1859, Buckland sought out and identified his remains, and they were removed to Abbot Islip's Chapel, on the north side of the nave of Westminster Abbey, at the cost of the Royal College of Surgeons. A memorial window was placed in Kensington Parish Church, by public subscription, in 1877.

John Hunter was of middle height, robust and vigorous, with short neck and high shoulders. His eyes were of a bluish-grey, and his hair was sandy in colour; before his death his hair became white. His portrait by Sir Joshua Reynolds is in the Royal College of Surgeons; there is a copy of this in the National Portrait Gallery. It was very successfully engraved by Sharpe in 1788.

Hunter was a most methodical man; every hour of his day, from dawn till midnight, was set aside for its appointed task. He was given to fits of abstraction. He noted down on odd scraps of paper his thoughts and the results of his experiments; these were afterwards arranged and copied out. Jesse Foot says: "He was incapable of putting six lines together grammatically in English," and his manuscripts were revised and corrected by others before

publication. Masses of his notes were afterwards destroyed by Sir Everard Home, who is said to have built up much of his reputation on what he appropriated from this material.

In manner Hunter was often impatient, rude and unceremonious. In speech he was too candid and unreserved. He possessed and read few books, but few men have done such great work with so little learning. He never took fees from curates, authors or artists. He was a Tory in politics and expressed the hope that "all the rascals who were dissatisfied with their country would be good enough to leave it."

Hunter's museum was bought by the nation for £15,000 and entrusted to the care of the Royal College of Surgeons. It was opened in 1813, when the Annual Hunterian Orations began.

Hunter's widow survived him till 1821, and he left a son and a daughter. The son, John, became an officer in the Army. His daughter, Agnes, married a Captain James Campbell. Neither left issue.

Billroth, the great German surgeon, says that Hunter's book on "Blood, Inflammation and Gunshot Wounds" (1794) is "the corner stone of modern English and German surgery." Hunter was an opponent of primary amputation for bullet wounds. In this he differed from Guthrie and the great surgeons produced by the Peninsular War. He appears to have been the first Army surgeon to realize the influence the velocity of the bullet has in the production of the injury; a factor not generally appreciated until within recent years. He was opposed to meddlesome surgery in the case of gunshot wounds. Abdominal wounds were to be left alone. Gunshot wounds of the lungs were not necessarily fatal. A bullet if not readily accessible, and not in a vital part, should be left alone. "The finger is the best instrument to make exploration with." He disagreed with Percy, Paré and Wiseman in their practice of enlarging gunshot wounds, although he recognized that on occasion such dilatation might be necessary.

Hunter's tomb in Westminster Abbey describes him as "the founder of scientific surgery," and the late Sir William MacCormac, in his Hunterian Oration, said "The surgery of the Middle Ages was a trade; Ambrose Paré and Jean Louis Petit converted it into an art, John Hunter elevated it to the rank of a science."

[CHIEF AUTHORITIES.—Lives by Ottley (1835), Jesse Foot, and Everard Home. *The European Magazine*, *The Gentleman's Magazine*, *The Annual Register*, 1761-63. "Disciples of Aesculapius," by Sir B. W. Richardson. Gordon's "Remarks on Army Surgeons." The Hunterian Orations. *The Dictionary of National Biography*.]

CELL-INCLUSIONS IN THE BLOOD IN BLACKWATER FEVER.

SECOND NOTE.

BY LIEUTENANT-COLONEL SIR WILLIAM LEISHMAN, F.R.S.
Royal Army Medical Corps.

SINCE the publication of my first note on this subject [1] I have had, thanks to the kindness of Sir Almroth Wright and Sir Ronald Ross, the opportunity of studying closely blood-films from two other cases of blackwater fever. It appears desirable to place the result of the examination of this further material on record, on the one hand because it adds somewhat to the significance of the inclusions described in the first case, and, on the other, because it is obvious that, should further experience prove them to have no connection with the disease, the sooner this is established the better, in order that the ground may be cleared for research in other directions.

As the material with which the first note was concerned was derived from a single case, it was naturally encouraging to find in these new cases the same cells and the same inclusions which were described in the first. At the same time, failure to find them would not necessarily have lessened the possible correctness of my suggestions as to their nature, since it is quite conceivable that the bodies found in the cells, whether of Chlamydozoal nature or not, may only rarely be encountered in the peripheral blood, while constantly present in some other situation.

The cases will be briefly described as "Case 2" and "Case 3," that dealt with in the first note being alluded to as "Case 1."

Case 2.—This consisted of a single blood-film, stained by Giemsa's method, which was taken by Dr. Dodgson from a native "boy" suffering from blackwater fever in one of the outlying mines of the Rand, and was most kindly sent to me by my old chief, Sir Almroth Wright. The film showed a very intense degree of leucocytosis; in fact, at first sight, and with a low power, it was suggestive of spleno-medullary leucocythæmia. On closer study, however, the blood picture differed in many respects from that disease. I have no record of the blood count, but a census gave the following relative proportions of the white cells. In making this census there was considerable difficulty at times in assigning a particular mononuclear cell to one of the four heads of "hyalines," "transitionals," "neutrophile myelocytes," and what I classed in connexion with Case 1 as "endothelial cells." Too much stress, then, is not to be

laid upon the strict accuracy of the percentages in connexion with these four groups of cells. There will be noted also a separate heading for what I have called "chrome cells," for the reasons given below.

Blood Census, Case 2.

Polynuclears	63·5 per cent
Lymphocytes	12·5 ,,
Hyalines	2·5 ,,
Eosinophiles	1·5 ,,
Transitionals	5·5 ,,
Myelocytes (neutrophile)	5·0 ,,
Turck's cells	2·0 ,,
Endothelial cells	5·5 ,,
"Chrome" cells	2·0 ,,

In addition to the above, very large numbers of nucleated red cells were present, in the proportion of one megaloblast and four normoblasts to every 100 white cells.

This blood picture makes it evident that the bone marrow in this case was gravely affected, a sign-post which might possibly indicate a useful path of exploration in the future.

No useful purpose would be served by an elaborate analysis of the census, and attention, both in this case and in Case 3, will be confined to certain special points and to the fresh features, or at least features fresh to myself, disclosed in each instance.

The cell-inclusions, described and sketched in connexion with Case 1 were found to be plentiful in this film. The cells in which they were encountered appeared to be of the same nature as those which were classed as endothelial cells in Case 1, and none were encountered in any of the ordinary leucocytes found in normal blood. The type of inclusion most commonly met with was that figured in Nos. 1 to 4 of the coloured plate, to which reference may be made. They stained a varying depth of pink or red, and were almost invariably clear cut and circular in contour. The forms were mostly homogeneous, the ring forms which were fairly common in Case 1 being rare in Case 2. None of the large forms, as shown in fig. 13 of the coloured plate, were found in this film.

In connexion with the various possibilities as to their origin, analysed in the former note, it was stated that the greatest difficulty was found in deciding whether they might not be altered or fragmented red cells which had undergone phagocytosis: this difficulty was even more apparent here, since undoubted phagocyted reds were found in some of these large mononucleated cells and a few even in cells which contained inclusions. In spite of this fact I

still consider that the inclusions are not explicable on this ground, and the more I have seen and studied them the more do I feel convinced of this.

The granules mentioned in the former note, as occurring in many of the cells which showed inclusions, were also found in this instance, though by no means invariably. Comparison between the granules of the two cases was rendered difficult by reason of the different staining methods employed. In Case 2, however, a remarkable feature of many of the mononucleated cells was the presence, often in great numbers, of granules in the cytoplasm which I was unable to refer to any of the types of Ehrlich or to the azure granules of normal lymphocytes or hyalines. These granules were deep red, and displayed an intense affinity for the chromatin element of the dye; they were a little larger than neutrophile granules, though not nearly so large as coarse eosinophile or basophile granules. Their distribution in the cell cytoplasm was patchy; while some cells were almost filled with them, others would show only a small clump localized in one portion of the cytoplasm. These granules were encountered in cells of several different types, but were never seen in polynuclears or in eosinophiles. It is possible that they represent a stage in the history of a Chlamydozoon, but this remains at present purely conjectural.

In both this case and Case 3 certain curious cells were found which I have never previously encountered, either in blood-films or in plates illustrating cytological work. These cells were not uncommon and could be readily distinguished from all others, even with a low power, by the deep chromatin tint of the whole cell; they were of the size of ordinary polynuclears and their nuclei were sometimes of that type, sometimes mononuclear. The cytoplasm appeared more or less completely filled with material which showed the chromatin reaction and, in almost every instance, the red colour was most intense at the periphery, giving the cell an appearance of being capsulated. In other instances the partial disruption of the cell permitted it to be seen that the red-staining material consisted of a mass of chromatin bodies, sometimes of quite irregular shape and size, but occasionally showing a tendency to ring form. It is difficult to convey the appearance of these cells apart from a coloured sketch, but the accompanying photographs (see figs. 1 and 2) give a fairly good idea of their general appearance. In each instance a cell was selected which was close to an ordinary polynuclear that the latter might serve as an index of comparison. For the sake of avoiding frequent periphrases I may perhaps be pardoned labelling

them provisionally "chrome cells." They will be mentioned again in connexion with Case 3.

Case 3.—The two stained films from this case were lent to me by Sir Ronald Ross, to whom I am further indebted for his interest in and criticism of my former note. These films have the further interest of being derived from the interesting case of which he published particulars, with Drs. D. Thomson and G. C. E. Simpson, at the end of 1910 [2]. In view of the full details there given, I need only mention that this case occurred under their own observation at Liverpool, and led them to the conclusion that neither the hæmoglobinuria nor the subsequent attacks of fever from which the patient suffered could be attributed to the toxins of malarial parasites.

Each of the films had been stained by Giemsa's method. As recorded in the chart of the case, 3,000 white cells per cubic millimetre were found on the day on which the films were taken, which was at the commencement of the third attack of fever, during which there was no hæmoglobinuria and no malarial parasites were found. For the sake of uniformity I may give the result of my own census of the white cells :—

Blood Census (*Case* 3).

Polynuclears	63·0	per cent
Lymphocytes	13·5	,,
Hyalines	7·0	,,
Eosinophiles	1·5	,,
Transitionals	7·0	,,
Myelocytes (neutrophile)	3·0	,,
Endothelial cells	4·5	,,
"Chrome" cells	0·5	,,

In this case, possibly owing to the leucopenia which existed, and the smaller number of endothelial cells, inclusions of the type found in Cases 1 and 2 were rare, only two or three cells showing them; those found were of the small homogeneous type figured in Nos. 1—4 of the coloured plate.

The special interest, however, of these two films was: 1st, that each showed a fair number of the "chrome cells" described in connexion with Case 2 and precisely identical with those in appearance, size and staining reaction; and, 2nd, that, in the case of one of the films, somewhat more deeply stained than the other, two cells were encountered which appear to suggest a possible connexion between the inclusions, so frequently alluded to, and the "chrome cells." Each of these cells I have photographed (see figs. 3 and 4), and the reproduction will show that, in each instance,

Fig. 1.

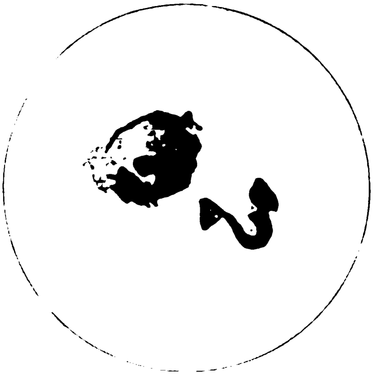

Fig. 2.

Fig. 3.

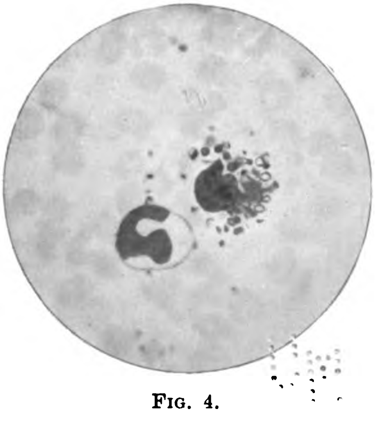

Fig. 4.

To illustrate "Cell-inclusions in the Blood in Blackwater Fever."

By Lieut.-Col. Sir William Leishman, F.R.S., R.A.M.C.

the cell wall has been ruptured and has liberated a number of deep-staining chromatin bodies, of varying size and showing a pronounced tendency to ring form. Contrasting these with the photograph of the "chrome cell" in fig. 3, where some of the chromatin contents of the cell are sufficiently isolated to show a tendency to similar ring form, it is hard to resist the impression that the well-marked bodies seen in the disrupted cells in figs. 3 and 4 represent a further stage in development of the elements which compose the red staining mass which fills the protoplasm of the "chrome cells" found in Cases 2 and 3. Again, as far as one can judge by staining reaction, size and shape, criteria of admitted insufficience, these chromatin rings are the same as the ring forms described in the endothelial cells in Case 1. I may add, since I have used the term "ring form," that the bodies in question show no resemblance to the ring forms of malarial parasites and could not possibly be confused with the latter.

As to the possible occurrence of similar inclusions in other conditions, Dr. G. C. Low [3] has recently recorded that he has seen bodies, apparently similar to those which I described, first in some cases of fever from Borneo, and second, in the blood of pellagra cases recently brought home by Dr. Sambon from Italy. I have not seen the specimens alluded to in Dr. Low's article, but I had recently an opportunity of discussing the subject with him, and of showing him a few of the inclusions from Case 1, and I think it possible that the smaller granules which he noted and has figured in mononuclear cells may have been azure granules. In these three cases of blackwater, azure granules were common in both lymphocytes and hyalines, but were quite distinct from the inclusions. It is quite possible that the larger inclusions of which Dr. Low speaks may resemble those in question here, but without seeing them I can express no opinion.

Major W. S. Harrison has, however, shown me a blood-film from a case of chronic malaria, in which there were present in large cells, of mononuclear type, homogeneous, pink-staining inclusions, which I agree with him in regarding as identical with the blackwater ones. In this case he said there was no history of blackwater and no probability of its development, but it appears to me of some significance that the officer in question had recently returned from Nigeria, where he contracted his malaria, and that blackwater fever is common in that country. Making the large assumption that the inclusions may eventually prove to be, or to be due to, the specific cause of this disease, it is quite probable that

it is only under certain, as yet unknown, conditions that they give rise to the symptom of hæmoglobinuria.

Should the further material which I hope to receive before long disclose any facts of fresh interest, either favourable or inimical to my views, they will form the subject of another note; the present one, as may be seen, is no more than a progress report, and any attempt to expand the hypothesis put forward in my former article appears unjustifiable in view of the paucity of the material.

REFERENCES.

[1] Lieutenant-Colonel Sir WILLIAM LEISHMAN, R.A.M.C. "Cell-inclusions in the Blood of a Case of Blackwater Fever," JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, vol. xviii, p. 493, 1912.

[2] Sir RONALD ROSS, D. THOMSON AND G. C. E. SIMPSON. "A Case of Blackwater Fever followed by a peculiar Relapse without Hæmoglobinuria or detectable Plasmodia," *Annals of Tropical Medicine and Parasitology*, vol. iv, p. 308, 1910.

[3] G. C. LOW. "Cell-inclusions in the Blood of Blackwater Fever and other Tropical Diseases," *Journal of Tropical Medicine and Hygiene*, June 1, 1912.

RECENT FACTS AS TO ENTERIC INOCULATION AND THE INCIDENCE OF ENTERIC AND PARATYPHOID FEVERS IN INDIA.

By Colonel R. H. FIRTH.
Royal Army Medical Corps.

In continuation of a short note on this subject which appeared in this Journal in November, 1911, the following information may be of interest to officers of our Corps in anticipation of official returns, and to others who may not have access to official reports. The facts refer to the European Army in India for the whole year 1911.

From a return made on the last day of the year, we find the position as regards inoculation on that day to have been as follows :—

Branch of service	Number of inoculated men who have not had enteric fever	Number of inoculated men who have had enteric fever	Number of not inoculated men who have not had enteric fever	Number of not inoculated men who have had enteric fever
Cavalry	4,478	153	767	72
Royal Horse Artillery	1,397	47	357	43
Royal Field ,, ...	5,993	100	1,272	194
Royal Garrison ,, ...	2,958	38	660	114
Ammunition columns	658	20	116	36
Infantry	43,820	606	4,375	512
Attached troops	390	7	65	10
Royal Engineers	38	1	73	5
Staff and departments	903	15	792	89
Totals	60,635	987	8,477	1,075

The number of cases of enteric fever which occurred among European troops in India during 1911 is the lowest on record. Throughout the whole of India only 170 cases were returned, with twenty-two deaths; this is an admission rate of 2·3 per thousand of strength, and a death-rate of but 0·3. The case mortality was 12·9 per cent. Of these 170 cases of enteric fever, we find that 106 were inoculated and sixty-four were non-inoculated men. Eleven deaths occurred among the inoculated and eleven among those not inoculated. The ratio per thousand of strength of admissions for enteric fever among the inoculated was 1·7, and the corresponding ratio of deaths was 0·17. Among the non-inoculated the admission rate was 6·7 per thousand, and the death-rate was 1·15. As regards

case mortality the percentage figures are 10·37 for the inoculated, and 17·18 for the not-inoculated. The disparity between the two groups is very marked. The co-efficient of correlation in the series between inoculation and freedom from attack by enteric fever is $0{\cdot}3212 \pm 0{\cdot}0068$, and that between inoculation and recovery after attack is $0{\cdot}7524 \pm 0{\cdot}0667$.

As in 1910, a differentiation has been made during 1911 between the classical enteric fever and the disease known as paratyphoid fever. For 1911, the returns show 104 cases of paratyphoid fever with two deaths. From all the cases of paratyphoid fever the specific bacillus has been isolated, so that no ambiguity exists as to the accuracy of diagnosis. Of the total cases so diagnosed, 103 yielded the *Bacillus paratyphosus* A, and one is reported to have been the B variety. One of the fatal cases was the result of intestinal perforation, and the diagnosis was not made until after death, when the specific micro-organism of the A variety was isolated from the ulcer. In none of these paratyphoid cases could the source of infection be traced to water, milk, or any special article of food. The incriminating factor in all the cases appears to have been the initial presence of an undetected and unsuspected infected person, indicating that in this particular disease man himself is the most dangerous factor. We are still in doubt whether the more frequent source of infection is by acute carriers or by unrecognized cases. Probably both sources are responsible, and call for immediate investigation and detection whenever two or more cases of the disease occur in any unit.

Our experiences at the two Enteric Depots at Naini Tal and Wellington throw a suggestive light upon this point. Since those depots were opened in 1908-9, no less than 1,229 cases of true enteric fever have passed through them, and from among this number twenty-six carriers have been detected, or, roughly, 2 per cent. Thirteen, or half of these carriers, were classed as temporary carriers, as they ceased to excrete the enteric bacillus within periods varying from a few weeks to three months. The other thirteen were classed as chronic carriers as they continued to be infective for periods varying from six to nine months. During the same period, 124 cases of recognized paratyphoid fever have passed through the depots. These have yielded one persistent or chronic carrier and seventeen temporary carriers, or, roughly, 1 per cent of the one kind and 13 per cent of the other. These facts indicate that, while the disease known as enteric fever gives only some 2 per cent of carriers of varying degrees of

chronicity, the disease known as paratyphoid fever gives as many as 14 per cent of carriers, of which 1 per cent are potentially dangerous for long periods of time. We are forced to the conclusion, therefore, that in paratyphoid fever the dangers to be associated with undetected and imperfectly recovered cases are considerably greater than in enteric fever, and it behoves us to leave no means untried to detect these cases, as the dominant factor in the prevalence or spread of this infective disease is man himself.

The influence of anti-enteric inoculation against paratyphoid infection appears to be negative. Of the 104 cases of paratyphoid fever, no less than ninety-seven were inoculated men, while the other seven cases were non-inoculated men. The admission rate for paratyphoid fever per thousand among the inoculated was 1·57, and 0·73 among the non-inoculated. The co-efficient of correlation between inoculation and freedom from attack by paratyphoid fever is $0{\cdot}1994 \pm 0{\cdot}0073$.

Under the term *enterica*, we combine the incidence of the two diseases, enteric fever and paratyphoid fever. For purposes of comparison it is necessary to so group them, as all our records anterior to 1910 make no attempt to differentiate between the two. That such differentiation is necessary is obvious from the marked difference between their respective case mortality rates and the apparent absence of inhibitory effect on paratyphoid fever by means of anti-enteric inoculation. Taking both enteric and paratyphoid fever together, we have had 274 cases in all India among European troops during 1911, with twenty-four deaths. This is equivalent to an admission-rate per thousand of 3·8, and a death-rate of 0·33 per mille of strength. Ten years ago, the admission-rate was 12·8, and the death-rate 3·32.

From the point of view of inoculation, the admission rate for the two diseases, enteric fever and paratyphoid fever, together is 2·75 per mille among the inoculated, and 10·88 among the non-inoculated. The corresponding death-rates per mille are 0·17 and 1·15; further, the co-efficient of correlation between inoculation and freedom from attack is $0{\cdot}2527 \pm 0{\cdot}0071$ and the co-efficient between inoculation and recovery after attack is $0{\cdot}6579 \pm 0{\cdot}0684$. The whole series of facts indicate that against enteric fever the value of inoculation as now practised is most marked, and the case in favour of the procedure much strengthened by our experiences during 1911. The disturbing factor is the prevalence of paratyphoid fever, against which disease anti-enteric inoculation appears to have little influence. This view is not new but emphasizes the

plea for a bivalent emulsion with which inoculation could be carried out against both diseases.

The recognition of the widespread prevalence of paratyphoid fever in India is quite a recent circumstance, and materially affects any comparative interpretation of our statistical returns as between the past and the present. The dominant factor is undoubtedly the question of diagnosis, as accuracy in this matter is our only means of determining the exact prevalence of this disease. Our returns for the last two years show this clearly. In 1909, paratyphoid fever was regarded as an unusual occurrence, in 1910 we developed more critical methods of diagnosis of the pyrexias, with the result that thirty-nine cases were recorded. In 1911, still greater care has been taken and the number of paratyphoid fever cases has risen to 104. As this policy and practice is pressed we anticipate that the detection and presence of this disease will be still more marked. The only certain means of diagnosing paratyphoid fever is the isolation of the bacillus from the blood or dejecta of the patient during life, or from the spleen or other organs after death. The disease is a septicæmia, and blood cultures made during the first week of the illness give a positive result in the majority of instances. Practically, the whole of our knowledge of the epidemiological and clinical characters of this disease is due entirely to the work of certain officers of the Royal Army Medical Corps in India, more especially to Major Harvey, Major Grattan and Captain J. L. Wood. To them we owe much information as to the serum reactions in paratyphoid fever. In India, the diagnosis of this disease by the serum reaction of the patient is particularly complicated by the fact that nearly all of them have been inoculated against enteric fever. In such cases even when the actual *B. paratyphosus* has been isolated, the agglutination titre of the serum for the *B. typhosus* rises and is often higher than for *B. paratyphosus*. Even under the most favourable circumstances the patient's serum rarely gives a positive reaction for the A variety of the paratyphoid micro-organism in a higher dilution than 1 in 100. Not infrequently the agglutination of *B. typhosus* is marked, while the *B. paratyphosus* A is not agglutinated by a 1 in 10 dilution of the serum. Further, it is not unusual to find in cases of undoubted paratyphoid fever, from which the A variety of bacillus has been isolated, that the patient's serum agglutinates at one time only the *B. typhosus* and at another time only the *B. paratyphosus*. The earlier work of Major Harvey and Captain Wood, both of the Royal Army Medical Corps, by

which they showed that the use of the absorption method gives valuable information as to the true nature of the infecting micro-organism, has been confirmed and developed. In cases of paratyphoid fever (A), in which the patient's serum agglutinated both the enteric and paratyphoid bacillus, absorption with the A type of bacillus removes all the agglutinins present, whereas absorption with the enteric bacillus removes only the co-agglutinins for that micro-organism, leaving intact the specific agglutinins for the *B. paratyphosus* A. Another curious fact is that by the absorption method it can be shown that in cases in which the patient's serum agglutinates *B. typhosus* but not *B. paratyphosus* A, then absorption with the latter micro-organism removes all the agglutinins from the serum.

Our experiences during the past two years bring out most clearly the variable and comparatively feeble production of agglutinins in paratyphoid fever, and it seems to be particularly characteristic of infections by the A variety of the *B. paratyphosus.* This point has been specially brought to the notice of medical officers, and it cannot be too thoroughly understood that as a means of diagnosis of paratyphoid fever the serological observations are beset with many fallacies and sources of error. Taken alone, they cannot be relied upon as a trustworthy routine method of diagnosis.

In closing this note, we are impressed with the view that a very close analogy exists between paratyphoid fever and enteric fever, both from the clinical and epidemiological aspects. In general terms, they differ only in the higher mortality and greater severity of enteric fever and in the character of the causal micro-organisms.

THE PAPATACI FLIES *(PHLEBOTOMUS)* OF THE MALTESE ISLANDS.[1]

By R. NEWSTEAD, M.Sc., A.L.S., &c.

(*Continued from p. 41, vol. xix.*)

SYNOPSIS OF MALTESE SPECIES OF PHLEBOTOMUS.

A. Abdominal hair recumbent.
  (*a*) Integument black. Large species. Palpi with second segment slightly longer than the third. *nigerrimus*, n. sp.
  (*b*) Integument ochreous. Small species. Palpi with second segment one half the length of the third. *minutus*, Rond.

B. Abdominal hairs more or less erect.
  (*a*) Legs in both sexes relatively short; average length of hind leg, 3 mm. Terminal segment of superior clasper of male scarcely half as long as the inferior clasper. *perniciosus*, n.sp.
  (*b*) Legs of both sexes relatively long; average length of hind leg, 4 mm. Terminal segment of superior clasper of male slightly longer than the inferior clasper. *papatasii*, Scop.

PHLEBOTOMUS NIGERRIMUS, n. sp.

FEMALE.—*Colour.* Head, thorax, and abdomen brownish black; hairs bright ochreous buff, those on the thorax being slightly paler and erect, those on the abdomen recumbent. Basal segment of antennæ dark brown. Palpi pale to dark brown, hairs similar in colour to those on the body. Legs pale ochreous buff, with ochreous white, *not silvery white*, refulgence. Wings ochreous buff or dull golden in some lights.

Head.—Proboscis long; eyes black, deeply emarginate in front. *Palpi* and *antennæ* very like those of *P. papatasii*. *Legs* very long, femur of hind pair nearly as long as the abdomen; tibia one and one-third times the length of the femur; tarsi longer than the tibiæ by about one-sixth, or nearly as long as the wing; ungues simple. *Wings* (fig. 5) with the hind margin strongly arched; sixth longitudinal vein short, terminating near the centre of the hind margin, the length equal to the distance, in a straight line, from its tip to the tip of the third longitudinal vein; the anterior branch of the second longitudinal vein twice the length of the distance between the two forks.

Length 2·50 mm.

The black or brownish-black colour of the integument of this

[1] Reprinted from the *Bulletin of Entomological Research*, vol. ii, by kind permission of the Scientific Secretary.

insect will serve as a ready means of distinguishing it from any of its allies. It may also be separated from *P. papatasii,* to which it is closely related in its morphological characters, by the shape of the wing and the shorter sixth longitudinal vein. The only two examples which were secured were taken by Captain P. J. Marett; both are females, one of which bears the data: "Black species, Gozo, 20, X, 10"; the other *P. papatasii,* dark variety 17, VI, 10, F."

Captain Marett had evidently, therefore, noted the black or dark colour of this insect in life; and when questioned regarding this he was absolutely certain that the colour was not due to post-mortem changes. It is, undoubtedly, a rare insect in the Maltese islands, otherwise more specimens would have been secured. We trust that Captain Marett will be able to obtain examples of the males, so that the characters of the armature may be examined and described.

PHLEBOTOMUS MINUTUS, Rondani.

MALE. — *Colour.* Integument rather opaque, dull golden ochreous. Antennæ with black and ochreous hairs mixed. Head with the clypeal and occipital tufts of hairs pale ochreous. Thorax with a median main-like tuft, a lateral tuft in front of the insertion of the wings and also a tuft on the scutellum, all pale ochreous with a golden tinge, but with a few intermingled black hairs. Abdomen densely clothed with recumbent, dull, golden ochreous hairs; those covering the genital organs intermingled with black hairs. Legs covered with scales which appear smoky brown in some lights, silvery ochreous in others. Hairs of the wing mixed black and ochreous, those of the costa not darker than those on the surface of the wing.

Head. Proboscis relatively short; clypeus hairy. *Antennæ* with the third segment a little longer than the fourth, but not nearly so long as the fourth and fifth together; the long verticillate hairs extending to the apical segment. *Palpi* (fig. 13) with the second segment one-half the length of the third; the latter much the stoutest and broadest; dorsally it appears incrassate towards the base; fourth segment not quite so long as the third; fifth much the longest.

Wings (fig. 7) very narrow, and bluntly lanceolate; divided into two almost equal halves by the third longitudinal vein; the upper or anterior branch of the second vein shorter than the distance between the two forks.

Legs. Hind pair a little more than three times the length of

the abdomen inclusive of the genitalia ; tarsus a little longer than the tibia.

External genitalia (figs. 14, 15) small ; superior claspers with four long spines : two apical and two subapical : inferior claspers very slightly swollen in the middle; intermediate appendage similar to that in *P. papatasii ;* intromittent organ nearly three-fourths the length of the inferior claspers; genital filament not protruding.

Length 1·5 to 1·65 mm.

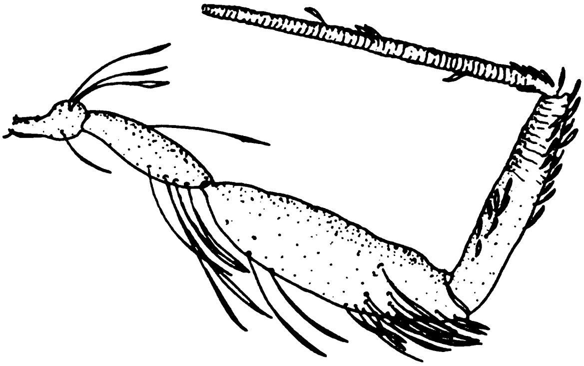

FIG. 13.—Palpus of *Phlebotomus minutus*.

FEMALE.—*Colour.* Wings with a distinct black costa and fringe ; wing-area also with numerous black hairs intermixed with the ochreous ones. Legs with the femora ochreous beneath, darker above ; tibiæ and tarsi blackish, with silvery grey scales. Thoracic and abdominal hairs as in the male.

Antennæ with the long hairs extending to the tip, the third to the ninth segments, inclusive, with geniculated and paired spines. *Palpi* as in the male.

Length 2 mm.

The distinguishing characters of this insect are its relatively small size, especially in the male ; the recumbent abdominal hairs ; the short third antennal segment ; and the marked character of the palpi. The male may be easily distinguished also by the form of the external genitalia.

The first two examples were captured by Major F. L. Dibblee, Royal Marine Artillery, at his residence at Sliema, August 20, 1910 ; and two additional specimens were taken by myself, one at Casa

Leoni, in a rabbit-hutch, August 31; the other at Floriana, August 27.

In captivity *Ph. minutus* is much more active than any of the other Maltese species, and when confined to a small area was almost incessantly moving from place to place. Apart from its flea-like actions it also has the remarkable habit of whirling round and round with great rapidity, so rapidly at times as to render itself almost invisible.

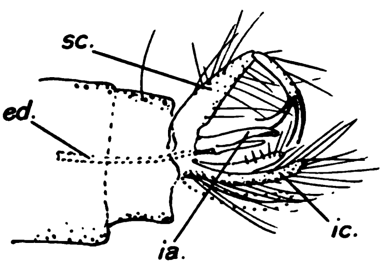

FIG. 14.—External genitalia of *Phlebotomus minutus*, ♂; *sc.*, superior claspers; *ic.*, inferior claspers; *ia.*, intermediate appendages; *ed.*, ejaculatory duct.

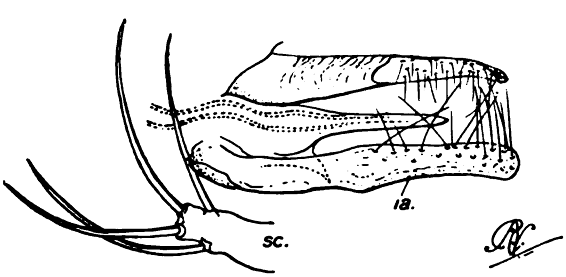

FIG. 15.—Superior clasper (*sc.*) and intermediate appendages (*ia.*) of *Phlebotomus minutus*, more highly magnified.

PHLEBOTOMUS PERNICIOSUS, n. sp.

MALE.—*Colour immediately after death.* Eyes black. Thorax with or without dull red-brown spots; when present they are arranged in a triangle, and there is occasionally a similar spot on the vertex of the head. Thorax and coxæ pale, translucent, ochreous; abdomen similar, but sometimes pale smoky grey. Hairs pallid. Wings faintly iridescent in strong light; pale drab in subdued light; costal fringe generally very dark or blackish grey, though examples with pale costal fringes are not uncommon.

Legs silvery grey, in a strong light presenting a distinct metallic lustre; in certain lights also those segments which lie in shadow appear almost black, and show up in marked contrast to those which are so placed that their surfaces refract the light. In some lights the under surface of the legs appears distinctly and regularly speckled, a character due evidently to the regular arrangement of the scales.

Head densely hairy, with generally two ill-defined tufts. Clypeus with a large tuft of hairs, some of which are directed forwards, others backwards towards the forehead.

Palpi with segments 2, 3, and 4 equal in length and collectively a little longer than the fifth. *Antennæ* with the second segment much longer than the two succeeding ones; the longest hairs on segment 14 almost equal in length to those on the preceding segment. *Thorax* densely hairy, usually with a tuft on the front portion and another on the scutellum. *Abdomen* densely hairy, the longest hairs arising from the apical margin of the segments, but no distinct tufts are found as in *P. papatasii*. The arrangement of the hairs is similar in both sexes, but blackish hairs are often intermixed with the pale ochreous ones on various parts of the body in the darker forms of this insect. *Legs* shorter than those of *P. papatasii*. *Wings* (fig. 6) with the posterior border much more strongly arched than the anterior border; the anterior branch of second longitudinal vein nearly as long as the stem between the cross vein and the proximal fork.

External genitalia (figs. 16, 17). Superior clasper with five very long, stout, curved spines; two apical, one external and two internal, placed a little in advance of the outer one; inferior clasper nearly twice the length of the intermediate appendage, and clothed to the apex with very long and slender hairs; intermediate appendage somewhat finger-shaped and hairy, proximal portion with a large keel-like extension ventrally, the distal margin of which bears several (5 to 6) hairs; apex of intromittent organ deeply divided or forked, with occasionally a minute central tooth; exposed portion of the genital filament about half the length of the intromittent organ.

FEMALE.—With the *palpi, antennæ and legs* similar to those of the male. *Wings* very slightly larger and broader than those of the male.

Length 1·9 to 2·2 mm.

This insect is widely distributed over the Island of Malta, and was extremely abundant during the month of August and the

beginning of September, though many examples were captured also in July. It was most abundant at Floriana, near the old bastion by the Grand Harbour, on the evenings of August 26 and 27, when, between the hours of 8.30 p.m. and 9.30 p.m. thirty-nine examples were captured as they came into a lighted room; of this total twenty-eight were males and eleven females.

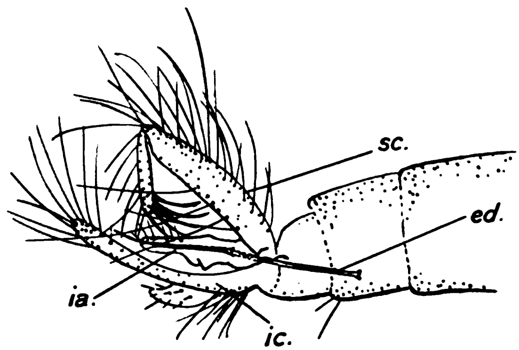

FIG. 16.—External genitalia of *Phlebotomus perniciosus*, ♂; *sc.*, superior claspers *ic.*, inferior claspers; *ia.*, intermediate appendages; *ed.*, ejaculatory duct.

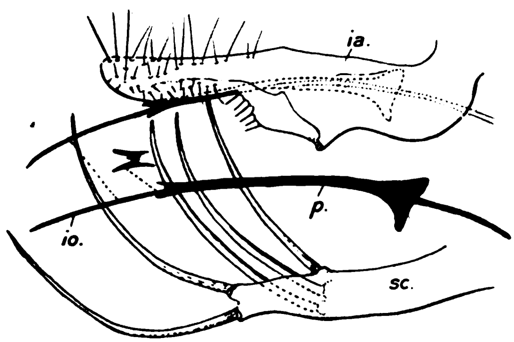

FIG. 17.—Portion of genitalia of *P. perniciosus*, ♂, more highly magnified; *sc.* superior claspers; *ia.*, intermediate appendage; *p.*, penis; *io.*, intromittent organ.

Two examples of *P. minutus* were found in association with this species; but strange as it may seem, not a single example of *P. papatasii* was either captured or seen on these occasions.

It was common also during the last week in August at Casa Leoni, the residence of the Hon. E. C. Roupell, D.S.O., Acting Lieutenant-Governor. In this place it was found most abundantly in a large outhouse which was tenanted by a number of rabbits.

In the early mornings, shortly after 6 a.m., numbers of sand-flies were found chiefly in the corners of the room, but many were also seen sitting about the walls in various places, though chiefly at the junction with the ceiling. Later in the day they were rarely seen in these situations; but examples could always be found in the dark earthen pots which were used, and generally occupied by the rabbits as retreats.

The male is easily distinguished from that of *P. papatasii* by its generally smaller size, shorter legs, and much smaller genital armature, which is little more than half the width of the abdomen. The female may also be distinguished by its shorter legs, and generally darker colour. After a few hours in captivity it also becomes generally much less active than *P. papatasii*, though it has the same hopping flight so characteristic of these insects.

PUPA (Pl. II, fig. 4).—Abdomen distinctly and sharply curved upwards so that a somewhat **S**-shaped outline is produced; thorax gibbose; abdominal segments each provided with a *pair of very large tubercles* (Pl. II, fig 5), the tips of which are furnished with a pair of broad, flat appendages; integument thickly covered with squamose spines (Pl. II, fig. 4).

The larval skin attached to the pupa does not present any morphological differences from that of *P. papatasii*, as far as one can gather from its shrivelled condition. It possesses the same kind of caudal bristles and hairy body-spines.

PHLEBOTOMUS PAPATASII (Scopoli).

Bibio papatasii, Scopoli. "Deliciae faun. et flor. Insubriciae," i, p. 55, Pl. XXII, fig. B. a. b. (1786).

Cyniphes molestus, Costa, "Storia dei lavori dell' Acad. Aspir. Natural., Artic. Zool." (1840); id., "Annali dell' Acad. Aspir. Natural.," i, p. 4 (1843).

Hermasson minutus, Loew (*nec* Rondani). "Stettin. Ent. Zeit." v, p. 115, Pl. I, figs. 1 to 5 (1844).

Phlebotomus papatasii, Grassi. "Mem. d. Soc. ital. d. Sci." (3), xv, p. 353 (1907).

This insect has been described so frequently that it seems unnecessary here to do more than add such particulars as have hitherto been overlooked, or imperfectly dealt with. In the first place it may be noteworthy to state that there are two distinct colour varieties of this common and widely distributed insect:—

(1) A uniformly pale form, which may be considered typical;

(2) A form which differs from the foregoing in having a dark

coloured fringe to the costa and hind margin of the wing; herein described as the dark form.

FEMALE.—*Typical pale form* (immediately after death).—Almost uniformly pale, translucent, ochreous, thorax with a long, dull red-brown median stripe, and a single spot of the same colour on either side, near the front margin of the thorax. Hairs on all parts of the body greyish, their arrangement similar to that of the male. Wing relatively broad (fig. 4). Wing fringe not markedly darker than the hairs on the disc of the wing.

MALE.—*Typical pale form* (immediately after death).—Colour similar to that of the female. Clypeus with a tuft of eight to ten hairs; head with a loose tuft, some of the hairs curving forwards, others backwards; tuft on nape of slightly longer ones, chiefly curved forwards. Thorax densely clothed; the hairs arranged in loose tufts. Wing much narrower than in the female (fig. 4). Abdomen uniformly hairy, with small tufts on the dorsum arising from the apical margin of each segment; superior claspers densely hairy, with a few black hairs intermixed with the pale ones; these hairs are easily deciduous, with the exception of a large tuft, which is more or less permanent in examples mounted in Canada balsam.

FEMALE.—*Dark form.*—General colour similar to that of the pale form. Wing fringes distinctly smoky grey; some of the hairs on the veins are dark grey or smoky grey.

MALE.—*Dark form.*—Not observed.

This form is not uncommon; but is very much rarer than the dark form of *P. perniciosus*. It does not differ structurally from typical pale examples, so that the following description of the palpi and antennæ applies to both varieties.

Palpi of five segments: 1 very short, slightly dilated distally; 2 a little longer than the succeeding one; 3 decidedly broader than the rest; 4 a little shorter than 3; 5 as long as or slightly longer than 2; 1 to 3 hairy; 4 and 5 scaly and with a few fine hairs. *Antennæ* (fig. 2) of sixteen segments: 1 and 2 the stoutest, the former with one side longer than the other, the latter bead-like; 3 much the longest, being equal in length to the last five segments together; 4 to 13 each very slightly shorter than the preceding one respectively; 14 to 16, inclusive, more strongly incrassate (swollen) basally than the rest; all the segments with the exception of 1 and 2 densely clothed with hairs, the longest of which arise from the incrassated portion of each segment, except on the terminal segments, which are furnished with hairs of equal length; 4 to 15,

inclusive, also furnished with a pair of stout spines (fig. 2), which are suddenly elbowed or bent at right angles to their insertion, so that for nine-tenths of their length they lie practically parallel with the surface of the segment to which they are attached.

The external genitalia of the male are much larger than those of any of the other Maltese species; a character which may be readily recognized in life, under a low magnification. The morphological characters are shown in the accompanying illustration (fig. 18). Length, 2·5 to 2·65 mm.

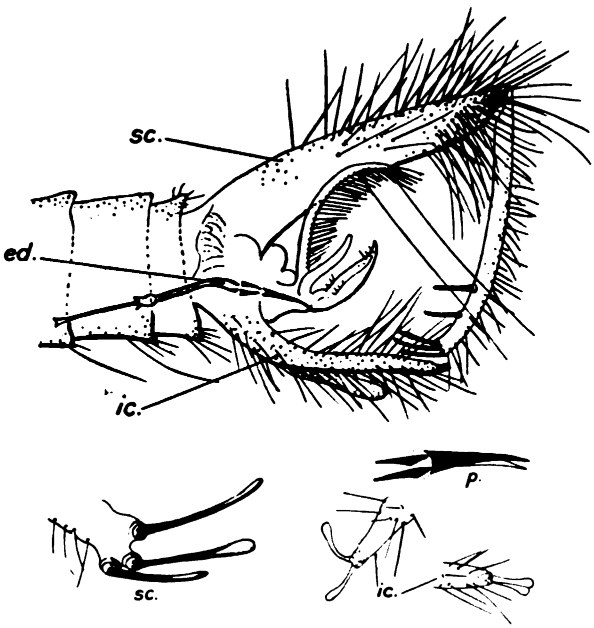

FIG. 18.—External genitalia of *Phlebotomus papatasii*, ♂ ; *sc.*, superior claspers ; *ic.*, inferior claspers ; *ed.*, ejaculatory duct ; *p.*, penis.

In captivity this insect is much more restless than *P. perniciosus*, so much so that after a few hours one may readily distinguish the two species by this alone, apart from the other characters—i.e., the generally larger size, paler colour, and much longer legs of *P. papatasii*.

OVUM (Pl. I, figs. 1 to 5).—When forcibly expelled from the body a day or so before the cuticle has become opaque the interior (oolemm) can be seen; and in such examples also the micropyle is distinctly visible as a short ring-like extension at the anterior pole

of the egg. The oolemm at this stage is filled with globular particles of fatty matter, suspended in a structureless matrix. When first laid the egg is translucent white and covered with a thin coating of viscous matter, by which it readily adheres to the surface upon which it may fall; five hours after it has been laid

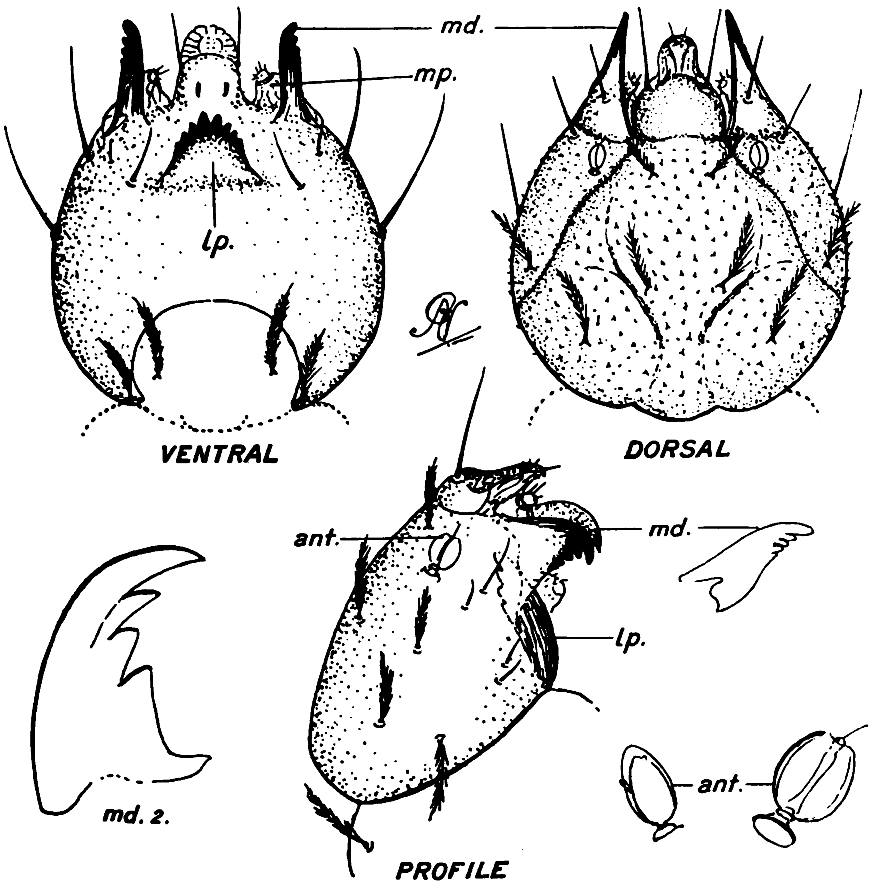

Fig. 19.—Head of larva of *Phlebotomus papatasii*. *ant.*, antenna; *md.*, mandible; *mp.*, maxillary palpus; *lp.*, labial plate.

it assumes its normal form and colour, which may be described as follows: Form very elongate, dark brown, shining, with longitudinal black wavy lines, which in certain lights give the periphery of the egg a faintly rugose appearance; these black lines are slightly raised, and are joined by slender cross-lines, so that a faint but rather coarse reticulation is formed. The transverse lines are,

however, very difficult to trace unless they are illuminated by a strong beam of light.

The incubation period lasts for about nine days; but unless kept in a moistened atmosphere the eggs will not hatch.

LARVÆ.—First instar (Pl. I, fig. 8). Cylindrical and distinctly caterpillar-like in its general form; head black; body white or ochreous white; caudal bristles, long, black. Head (fig. 19) very broadly pyriform; frontal hairs two in number; simple; dorsally there are three similar hairs on each side; one arising from the mid-region of the mandibles, one near the base; and a slightly longer one towards the centre of the head, near the margin; besides these there are at least four hairy spines on each side, arranged as shown in the illustration. Antennæ (fig. 19, *ant.*) composed apparently of three segments, the first two being quite rudimentary and ring-like; third segment broad, flat and ovate in outline, the anterior edge faintly emarginate and furnished with a centrally placed hair. Mandibles (fig. 19, *md.*) large and provided with four distinct but rather blunt teeth, of which the apical one is much the largest. Labial plate (fig. 19, *lp.*) somewhat triangular in outline with four teeth on each side, the median ones being much the largest; in its general form the labial plate resembles those found in the larvæ of the CULICIDÆ. Articulations of the body clearly defined; each segment bears from four to five hairy spines on each side, all of which are broadly dilated apically. Caudal bristles in two pairs, one of which is much the longer, almost equalling the length of the body, the other pair are extremely short.

Last instar (Pl. I, fig. 7).—Form resembling that of the first instar; colour pale ochreous white; head black; caudal bristles black, arranged in two pairs, each pair being attached to a large tuberculous process; the inner bristle is much the longer, almost equalling one-half the length of the body of the larva; all of these bristles, under a high magnification, present a number of extremely fine, equidistant, and intensely black surface lines, the intervening spaces being distinctly pale; it is highly probable, therefore, that these bristles are finely striated, but as no sections were cut it is impossible to determine their true structure by examining them in optical section only. Thoracic and abdominal spines (Pl. I, fig. 10) much longer and stouter than those in the earlier stages; apices *narrowly dilated* and transparent, the remaining portion clothed with minute stiff hairs; these hairy spines are arranged in more or less regular transverse rows, there being four or five on each side of the median line. Head with several large spines

similar to those on the abdominal segments, but they are pointed instead of being dilated at the apex; besides these hairy spines there are also several rather long stout hairs, four of which are frontal. Sucker feet similar to but relatively larger than those in the first instar.

Length, 2 to 3·28 mm.

PUPA.—(Pl. I, figs. 11, 12).—When empty, clear ochreous buff. Eyes in life black. Abdomen curved upwards distally in varying degrees, but not apparently so distinctly **S**-shaped as in *P. perniciosus;* considerably wider in the thoracic region than at the distal segments of the abdomen; integument clothed with minute squamose spines (Pl. I, fig. 15), which are most conspicuous on the abdominal segments. Thorax with two tubercles on each side, the anterior one bearing two or three long slender spines. Abdominal segments each with one (possibly two) extremely minute tubercles, at the apex of which is a minute, broad, flat spine; those on the seventh and eighth segments more conspicuous than the rest; but all of these processes are so minute as to be easily overlooked. Wing-sheaths pointed apically and extending subventrally as far as the base of the seventh abdominal segment. Head distinctly elongated and somewhat triangular in outline; in the empty pupa this often breaks away in the process of mounting, when the outline may be seen to bear a striking resemblance to the head of an ox in miniature (Pl. I, fig. 13). Antennal sheaths distinctly segmented, lying curved behind the eyes, and subsequently following the costa of the wing-sheath. Palpal sheaths originating near the centre of the frons, extending backwards and then curving suddenly forward so that the apex rests against the antennal sheath and lies pointing in the same direction. Legs extending slightly beyond the wing sheaths.

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PLATE I.

Phlebotomus papatasii, Scop.

Fig. 1.—Eggs, approximately natural size.
,, 2.—Egg, a few hours before extrusion, showing micropyle.
,, 3.—Egg, freshly extruded.
,, 4.—Egg, a few hours after extrusion.
,, 5.—Egg, much enlarged, to show reticulated surface.
,, 6.—Larva, approximately natural size.
,, 7.—Sketch of adult larva, enlarged.
,, 8.—Larva; first instar, enlarged.
,, 9.—Stigma of larva with spine.
,, 10.—Hairy spine of larva.
,, 11.—Pupa, approximately natural size.
,, 12.—Pupa enlarged: *ls*, larval skin with anal bristles attached.
,, 13.—Front view of the head of the pupa: *e*, eye; *a*, antenna; *p*, palpus.
,, 14.—Thoracic tubercles of pupa.
,, 15.—Squamose body-spines of pupa.
,, 16.—One of the abdominal pupillæ of the pupa.

PLATE II.

Phlebotomus papatasii, Scop.

Fig. 1.—Imagos, approximately natural size.
,, 2.—Male enlarged; from life.

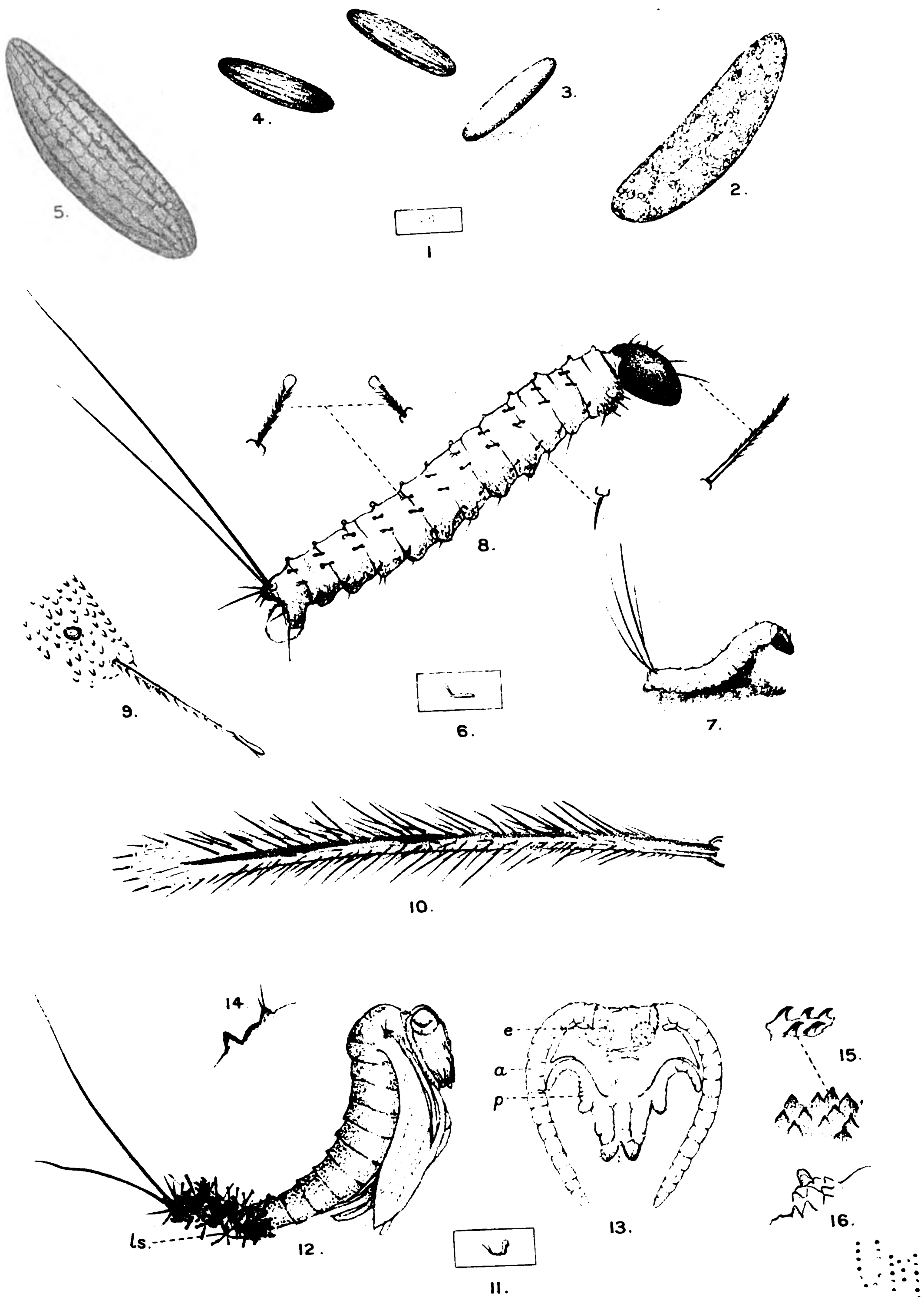
Phlebotomus perniciosus, Newst.

,, 3.—Pupa, approximately natural size.
,, 4.—Pupa, enlarged.
,, 5.—One of the abdominal tubercles of the pupa.
,, 6.—Squamose spines of the abdominal segments of the pupa.

PLATE III.

Fig. 1.—*Phlebotomus papatasii*, Scop., female, enlarged; from life.
,, 2.—*Phlebotomus perniciosus*, Newst., female, enlarged; from life.
,, 3.—*Phlebotomus perniciosus*, approximately natural size.

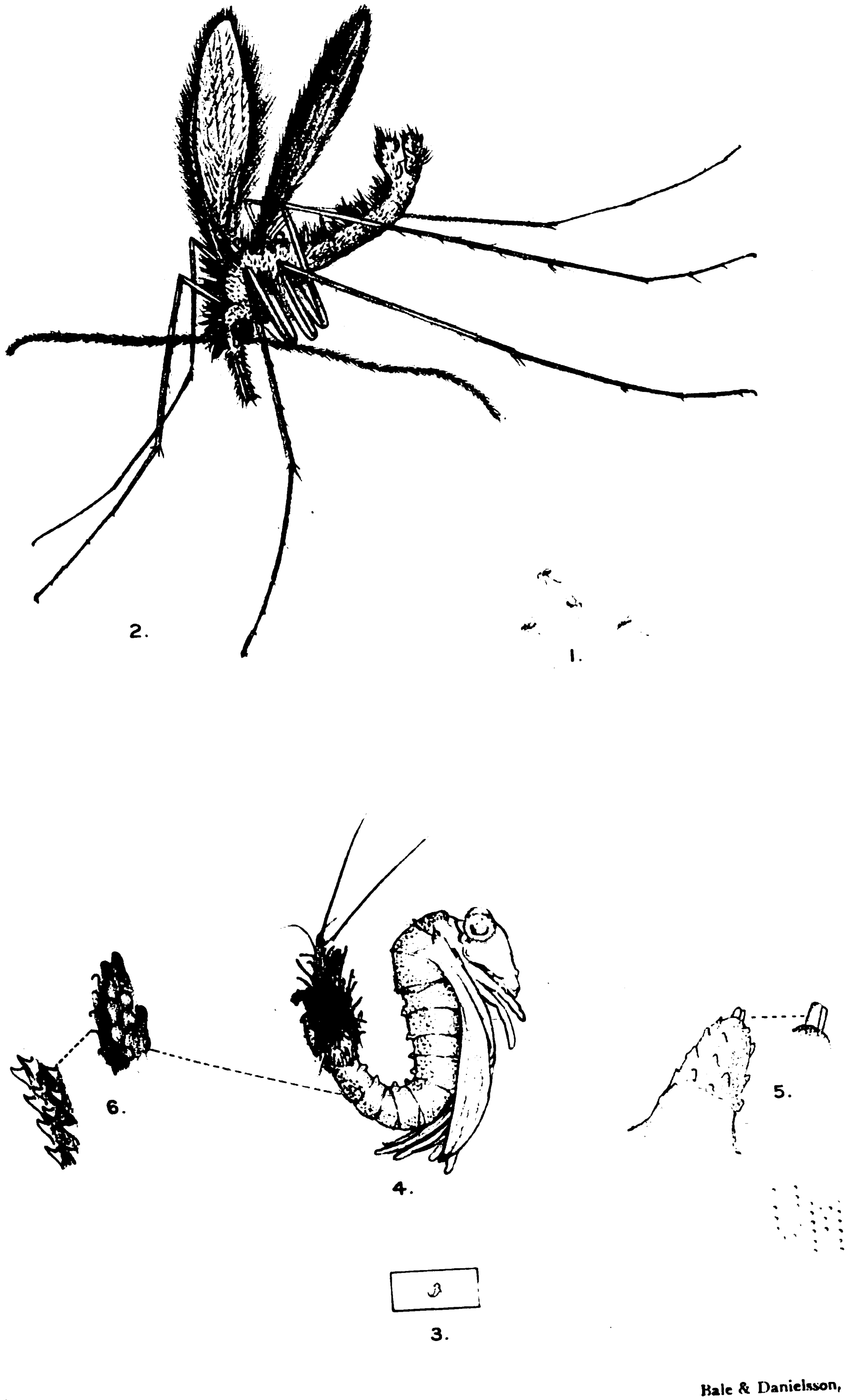
[Note.—The above enlarged figures and that of the male shown on Plate 2 are all drawn to the same scale.]



R. Newstead, *ad. nat. del.*

Bale & Danielsson, Ltd., *lith.*

PHLEBOTOMUS PAPATASII



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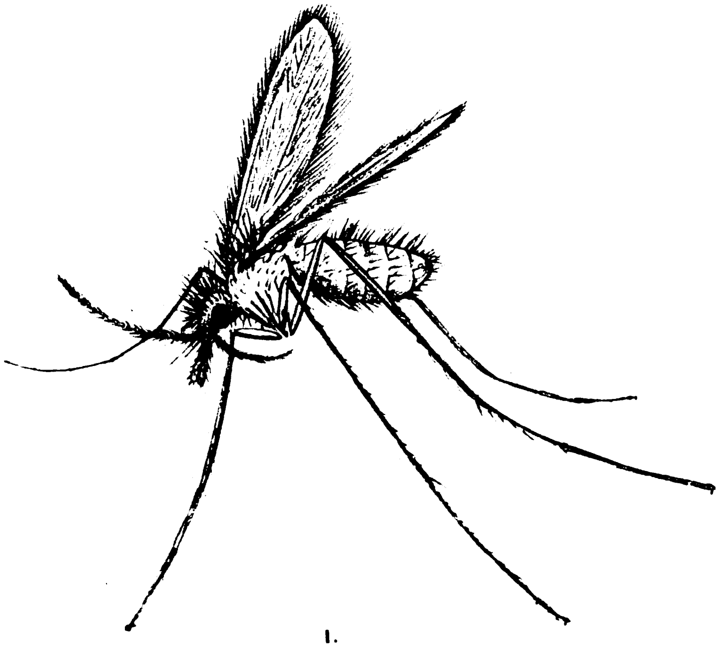
PHLEBOTOMUS PAPATASII AND P. PERNICIOSUS.



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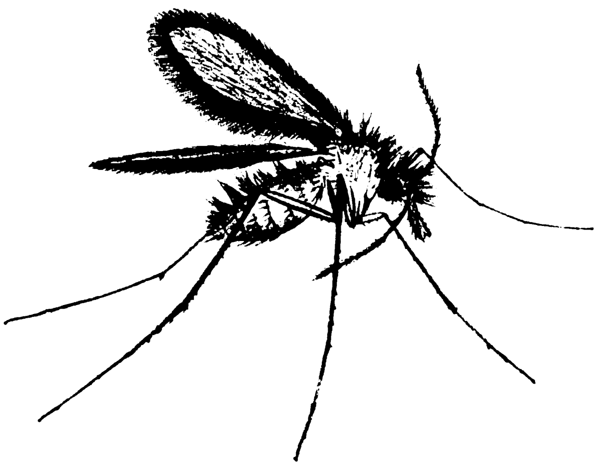

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Bale & Danielsson, Ltd., lith.

PHLEBOTOMUS PAPATASII AND P. PERNICIOSUS.

SHELTER TENTS.

By Captain N. DUNBAR WALKER.
Royal Army Medical Corps.

PART I.

Introduction.

It is by no means a modern idea that two or more soldiers should carry on their persons materials which can be formed into a shelter tent. It is said that the Macedonians had small tents made of skins, which provided shelter for two men.

Cromwell's army appears to have been supplied with a form of portable shelter tent. Firth[1] states that during the campaign in Scotland in the summer of 1650, small tents, one to every six men, were carried by them in parts, and he quotes from Terry's "Life of Alexander Leslie," that when a battle was imminent the soldiers "cast away their biscuit with their tents upon confidence they should then fight." The idea of the *tente-abri*, which is the recognized type of shelter tent, seems to have originated among the French troops in Africa in 1834-35. The Zouaves used their turban cloths stretched across sticks for shelter, and this method of protection from the weather was copied by the European troops who formed a tent from a couple of their camping sacks which had been unstitched. These camping sacks (*sacs de campement*) were first issued during the wars under the First Empire and added to the personal comfort of the soldier when used either as a sleeping bag or mattress. They were also used for fatigue duties such as drawing rations, and remain to this day as the "*sac à distribution*."[2]

The infantry of the following Powers carry on their persons materials for the construction of shelter tents:—

Austria	Germany	Italy
Norway	Russia	Sweden
Switzerland	Turkey	U.S.A.
Japan.		

From this list it will be seen that the majority of European Powers consider this piece of equipment necessary.

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[1] Firth, "Cromwell's Army, 1622-1660," 1902.

[2] Lecompt, "A Description of the *tente-abri*." Translated by Colonel Hallwell, 1859.

Great Britain, France, Belgium, Holland, Denmark and Spain, are the Powers which do not at the present time include a tent piece and accessories in the load carried by the soldier.

Both France and Spain have official patterns in use, but only the Alpine troops of the former habitually carry them, and in the latter country they are rarely carried. From this it will be seen that we are the only first-class Power whose troops do not carry a shelter tent.

The above remarks will serve as an introduction to the detailed study of the various shelter tents employed by different nations. A great deal of the information has been obtained from actual specimens of these tents in the Museum of the Royal Army Medical College.

PART II.

Detailed Description of Shelter Tents in Use.

Great Britain.—The tents carried by Cromwell's[1] men have already been alluded to. About a century later they still seem to have been employed, but since then the British soldier has done without them. In 1855 a supply of *tentes-abris* was sent to the Crimea,[2] but they were never used, as they arrived just as peace was declared. They were made in France, and consisted of two pieces of canvas 3½ ft. by 4½ ft. in dimensions, and two elm sticks 4 ft. in length. Each man was to carry a piece of canvas, a stick, three pegs and a cord, making a total weight of 2 lb. 10 oz. At first the sticks were not spliced and the soldier was supposed to use them as a walking-stick.

Suggestions have been made from time to time to re-introduce shelter tents. Captain Rhodes'[3] Patent Bivouac Tent, of 1860, consisted of waterproof sheeting stretched over a framework of hoops or ribs. An area of about 6 ft. square was thus enclosed, the height of the tent being 3 ft. 6 in. The total weight of this tent was 8 lb., one man carrying half. He claimed that the waterproof sheet could be used as a cloak or cape in bad weather. The ribs when packed up and bound round with the ground lines were supposed to form a walking-stick.

During the Zulu war a shelter tent was issued to troops on service at the Cape. "Each man carried a canvas sheet, made up of

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[1] Firth, *loc. cit.* [2] Hallwell, *loc. cit.*
[3] Rhodes, "Tents and Tent Life," 1858.

a quadrangular (5 ft. 9 in. by 5 ft. 3 in.) and of a triangular piece (2 ft. 8 in. in height by 5 ft. 3 in. base). Buttons and button-holes were sewn along three sides, and a stick (4 ft. long divided in the middle), three tent pegs, and rope were also provided. Two or four of these sheets could be put together, the triangles forming the ends of the flaps. A very roomy and comfortable shelter tent, 4 ft. in height, was formed, which would, with a little crowding, accommodate six men, so that two sheets could go on the ground." The weight per man was excessive, and in consequence it was condemned by Lord Wolseley.[1]

To-day there is an official shelter tent equipment,[2] but it is not meant to be carried on the person, and is only issued to certain Royal Engineer units on mobilization. It consists of two unjointed poles 4 ft. long, two squares of canvas 6 ft. by 5 ft. 4 in., with seven pegs and mallet. The total weight of the tent complete is 14 lb. 7 oz.

Improvised shelters, such as are now to be described, can be made from blankets or waterproof sheets. It must, however, be noted that these articles are carried on the transport and not on the person. A waterproof ground sheet weighing 2 lb. 8 oz. is carried on the second line transport for each man. One blanket per man may also be carried, but only when specially ordered.

The Blanket Shelter.[4]—To construct one of these shelters two "special service blankets" are used. These are the "general service blanket," measuring 7½ ft. by 5 ft. and weighing 4½ lb., specially fitted with fourteen eyelet holes and four lines. There are five holes on each side (one hole being in each corner) and two others at each end. "Poles, wood, s.s. blanket, 4 ft." are articles of store, but generally rifles and improvised sticks are used as supports.

The two supports are planted in the ground and stayed by weather lines, and a line stretched between the two poles will act as a ridge piece. Two blankets laced along their long borders form the covering over this framework, the free edges being pegged down. An area of 7 sq. ft. is thus covered, which affords shelter to two men. If only "general service blankets" are available the two blankets can be pinned together by wooden skewers along the ridge.[5] This practice must be very detrimental to the blankets.

[1] Notter and Firth, "Theory and Practice of Hygiene," 1900.

[2] "Priced Vocabulary of Stores," Part I, 1909.

[3] F. S. Manual, Infantry Battalion, Expeditionary Force, 1910.

[4] "Improvised Methods of Aid in the Field," Lieutenant-Colonel H. Mackay, R.A.M.C. (T.), 1911.

[5] "Military Engineering" (Part V.) Miscellaneous, 1907.

The Waterproof Sheet Shelter.—This can be constructed with "sheets ground waterproof" measuring 6 ft. 6 in. by 3 ft. fitted with thirty-six eyelet holes. To construct a shelter with two of these sheets exactly the same procedure is employed as described in the case of the blanket shelter. "Military Engineering," 1907, Part V., Sec. 1., Para. 8, suggests and illustrates various types of shelters constructed with brushwood, hurdles, &c.

India.—The Indian waterproof sheet is made of rot-proof cotton-canvas measuring 7½ ft. by 5 ft. and has twelve brass eyelets. It weighs 3½ lb. (Indian Stores Department pattern, No. 3,076). The sheets are carried in the second line transport and can be used to make shelters. The men of the 8th Gurkha Rifles during the Abor Expedition hutted themselves with these Government waterproof sheets stretched on a bamboo framework.

Some native regiments have regimental patterns of *tentes-abris* for use on manœuvres, but these are not official and are provided out of regimental funds. Captain A. G. Stuart has kindly given me the particulars of the one used by his regiment, the 40th Pathans.

A tent to shelter two men comprises:—

	Cost			Weight	
	r.	a.	p.	lb.	oz.
2 waterproof sheets (6¾ ft. × 4½ ft.)	12	4	0	11	0
2 iron-shod bamboo poles (3¾ ft. long and 1 in. in diameter)	0	3	6	2	0
8 iron pegs, each 6 in. long	0	2	0	3	0
6 short lengths of tape or twine	—			—	
2 log lines	Gov. supply			0	8
	12	9	6	16	8

The waterproof sheets are made of green Willesden canvas (4 ft. 6 in. wide). There are three brass eyelets on the ground side of the sheet and four on the roof side. The roof log line to support the roof goes under the sheets through the two centre eyelets.

All the parts are carried on the transport, increasing the load per head by 2½ lb.

France.—The *tente-abri* was first introduced officially, as already stated, for the troops serving in Africa in 1850 and to the whole French Army in 1854. These tents were used in the Crimea and were denounced as "dog tents" because a man had to crawl into one on all fours.[1] They were made with pieces of white linen 5 ft. 5 in. by 5 ft. 2 in. At first the rifles were used as supports

[1] Kinglake. "The Invasion of the Crimea," vol. vi, 1880.

but later a pole 3 ft. 8½ in. long in two pieces was issued. The pole pieces were joined by means of a tin socket. One man's share consisted of one linen piece, one tent pole in two pieces, two pegs and cords and weighed 1·82 kilo. (4 lb.). Attempts have been made from time to time to reduce this weight, and in 1897 bamboo supports were tried but do not seem to have proved a success.[1]

After the Franco-Prussian War these tents no longer formed part of the regular equipment, and to-day only the Alpine troops carry them habitually. The 1907 pattern consists of a tent piece made of cotton cloth, pale brown in colour and rendered impervious to water. These sheets measure 5 ft. 3 in. square and have seven aluminium buttons along each side to join the sheets together. Button-holes are provided along three sides. At two corners of the sheet there are aluminium ringed holes to receive the ends of the supporting poles and along the side that has no button-holes, eyelet holes for the pegging down cords are inserted.

The poles are in two pieces, and when socketed together form a pole measuring 2 ft. 1½ in. The accessories consist of smooth steel pegs, small tarred cord (*cordeaux de piquet*) and long cords (*cordeaux de tirage*) to stretch between the two pole tops.

Each man's share is made up as follows :—

	grm.
1 tent piece	700
1 pole in two pieces	185
2 steel pegs	150
3 "cordeaux de piquet"	17
1 "cordeau de tirage"	24
	1,076 (2 lb. 6½ oz.)

Pitched in the ordinary way where two men join their pieces together no protection is given at the ends. The most usual method is to employ six pieces, four of these form the roof and the two remaining pieces close the ends.

The sheet is folded with the pole pieces inside and strapped to the top and sides of the knapsack, care being taken that the pole pieces are so placed as to lie along the top. The pegs and cords are placed inside the knapsack.

Germany.—In the war of 1870-71 the Germans carried no tent, but in 1892 they were adopted. At present 170 men per company (259 men war strength) carry shelter tent pieces, and 10 per cent of them are for the use of the officers.

[1] Lavisse. "Sac au dos," 1902.

In the 1909 pattern, the tent piece, made of brown (colonial pattern, dark green) waterproof flax, is 5 ft. 3 in. square. These tent pieces fasten together by means of aluminium buttons and button-holes (in some patterns by stud fasteners) eight on each side. At each corner of the sheet there is a large aluminium ringed eyelet hole to receive the ends of the supporting poles. Some twelve cord loops permanently attached, two at each corner and one on each side, provide means for pegging the sides to the ground.

The poles are in three pieces, jointing together like a fishing rod by means of aluminium ringed sockets ; a jointed pole measures 3 ft. 7 in. The other accessories consist of varnished wooden pegs, shod and capped with metal, and lines. There is a metal stud on one side of the peg to hold the guy rope. The specification of these tents enters into very minute details, for example, the sheet must withstand a 3 in. head of water for twenty-four hours without any water actually dripping through.[1]

The weight of a man's share is as follows :—

	grm.
1 tent piece	1,160
1 pole in three pieces	290
3 pegs	145
1 guy rope	25
	1,620 (3½ lb.)

The tent piece may be carried in one of three ways : (1) Folded flat and placed under the flap of the knapsack ; (2) Wrapped round the great coat ; (3) folded flat and strapped to the knapsack, either above or below the great coat. The remaining portions are carried in the accessories bag, which hangs in the interior of the knapsack.[2]

In bad weather a single sheet can be worn as a poncho, but must not be pulled in too tight at the sides, as points of contact in heavy rain soon cause it to leak. For the same reason they form no protection for a soldier sleeping on wet ground.

The regulations require that great care be exercised in the handling of this piece of equipment, and it is very doubtful if these tents would remain efficient for any great length of time during a campaign.

There are a great number of ways in which these tent pieces

[1] Hoffman, "Lehrbuch der Militärhygiene," vol. iii, 1911.
[2] "Vorschrift über die tragbare Zelt-Ausrüstung," Berlin, 1892.

can be employed to make shelters.[1] Two men can join their pieces together in the ordinary way (*Zelthütte*, Plate I, fig. 4), but with this method no shelter is afforded at the ends. With three pieces in dry weather, by the addition of a fourth pole, an airy protection from the sun is secured (Plate I, fig. 5). By closing in one end of a tent formed from two pieces, pitched as first suggested, with two others, proper shelter for four men can be obtained (Plate I, fig. 6).

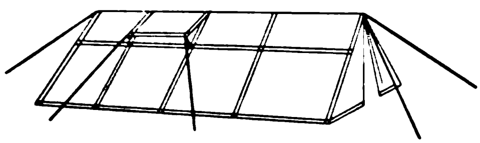


Fig. 1.—(Korporalschaftszelt).

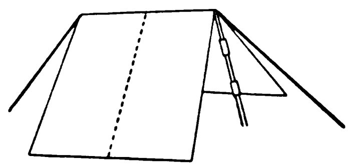


Fig. 4.—(Zelthütte).

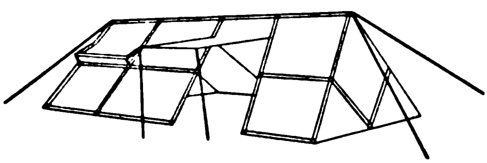


Fig. 2.

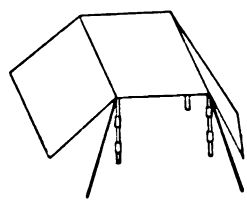


Fig. 5.—(Zelthütte).

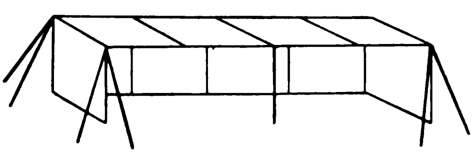


Fig. 3.

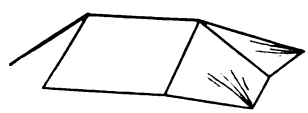


Fig. 6.

Plate I.—German Shelter Tents.

Sometimes shelters are constructed to accommodate as many as sixty men. These are rather on the principle of a long tunnel, with one sheet for the roof and one for each side, the requisite number of such sections being joined together. If longer and stronger poles are available, more roomy shelters can be made (Plate I, figs. 1 and 2, *Korporalschaftszelt*).

All the methods in which a large number of pieces are used have the serious objection that they are very difficult to ventilate,

[1] Hiller, "Die Gesundheitspflege des Heeres," 1905.

on account of the large number of men accommodated under one roof. The best method of using the sheets in any number is to have the side away from the wind open. Thus by joining ten pieces together in the following manner an excellent shelter is provided for twelve men: Four pieces form the roof, four the back, and one piece at each side (Plate I, fig. 3).

Austria.—The shape of the Austrian shelter tent piece is a departure from the usual square. It is in the form of a diamond

PLATE II.—Austrian Shelter Tent (made with two sheets).

with sides measuring 6 ft. 7 in. The material is drab coloured canvas made waterproof. On all four sides there are button-holes and toggles 1·2 in. long. There are thirty-six of these button-holes with 8 in. between each. The buttons are on both sides of the canvas, thirty-four on the outside and eighteen inside. At the apex of one of the obtuse angles of the piece is sewn a leather patch, carrying a metal ring shaped just to slip over the bayonet scabbard. The rifle with fixed bayonet "*en scabbard*" forms the tent support. Three wooden pegs, iron-shod and with a band of iron

round the head, together with two guy ropes complete one man's share. The total weight of the share is 1·313 kilo. (2·9 lb.).

For men without rifles a pole in six pieces is provided, three pieces being one man's share. A completed shelter tent is supposed to shelter a number of soldiers equal to one-and-a-half times the number of pieces used. It may be constructed of two, four, or even a greater number of pieces. Joining two pieces together (see Plate II.) we have a tent, pyramidal in shape, the rifle raising it to some 50 in. in the centre. This will shelter three men. The commonest method of construction is to join four pieces together to shelter six men.

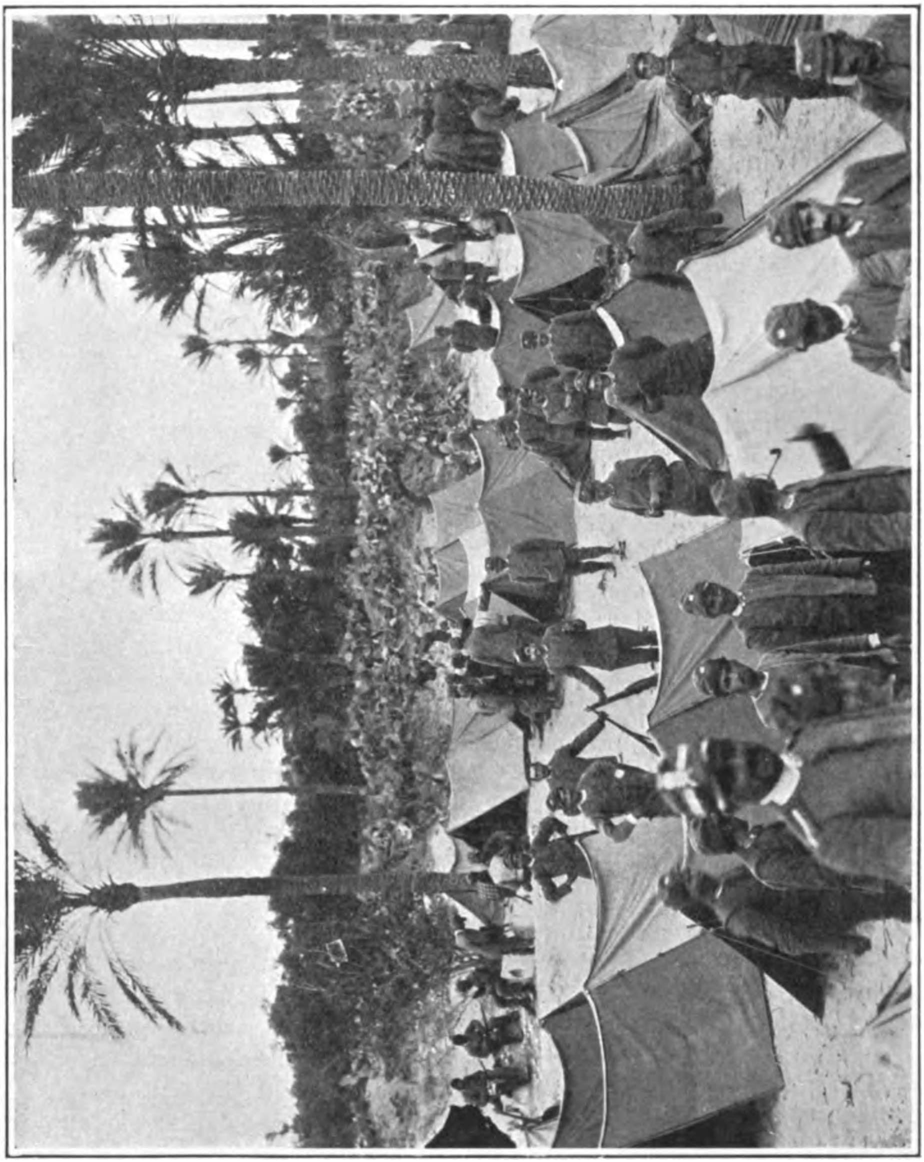
The tent piece is carried and wrapped round the great coat on the outside of the knapsack, the pegs are placed inside the knapsack.

Italy.—The old Italian shelter tent which many of the troops in Tripoli are using is formed by pieces of brown canvas 68 in. square. The supporting poles are in three pieces fixed together by iron sockets. One pole when jointed measures 54 in. Along one edge of the canvas square are nine bone buttons and button-holes for joining one sheet to another. At each corner of this side are holes to receive the heads of the supports. The remaining corners carry loops of rope for pegging the sides down. The sheet, pole in three pieces, four pegs and guy ropes complete one man's share and weigh about 3 lb. 12 oz. There is a lighter form of this tent with a pole in two pieces and a smaller piece of canvas; one man's share of this tent only weighs 2 lb. 3 oz. These tents when constructed with the pieces carried by three men have one end open, but when six men's sheets are used a completely closed tent can be formed to shelter its bearers. (See Plate III.)

In 1905 a new tent was tried called the "Bucciantini tent" and is now being adopted. A complete tent consists of four pieces of canvas, four poles and eight pickets, and it is stretched over one central ridge pole.

Each tent is intended to be carried between four men; a section of canvas, one pole, and two pickets weighing about 3·3 lb. The tent accommodates five persons, each fifth man carrying pieces to provide shelter for officers and non-commissioned officers. It is about one-third less in volume and weight than the tent first described. The canvas pieces can be used as ponchos and all parts of the tent are interchangeable.

The poles are cylindrical, made of beech wood, and the pieces are joined by very strong steel sockets. The length of one pole is 24·8 in.

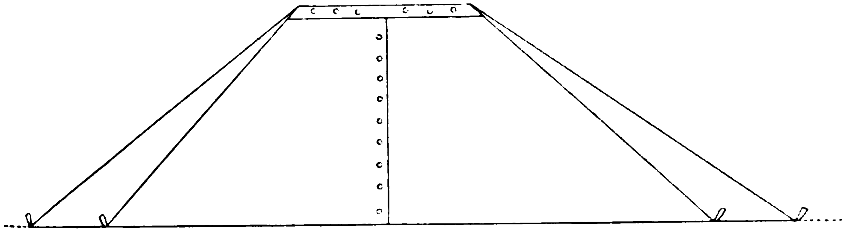


[*London News Agency.*]

Plate III.—Tente-abri. Italians in Tripoli.

Three lengths of pole are jointed together and form the vertical support, and the remaining length forms the ridge pole; this gives the tent an internal height of 5·75 ft.

The khaki coloured canvas pieces are pentagonal in shape and are diagonally stitched and doubled in certain parts, which are



Side-view of Tent pitched.

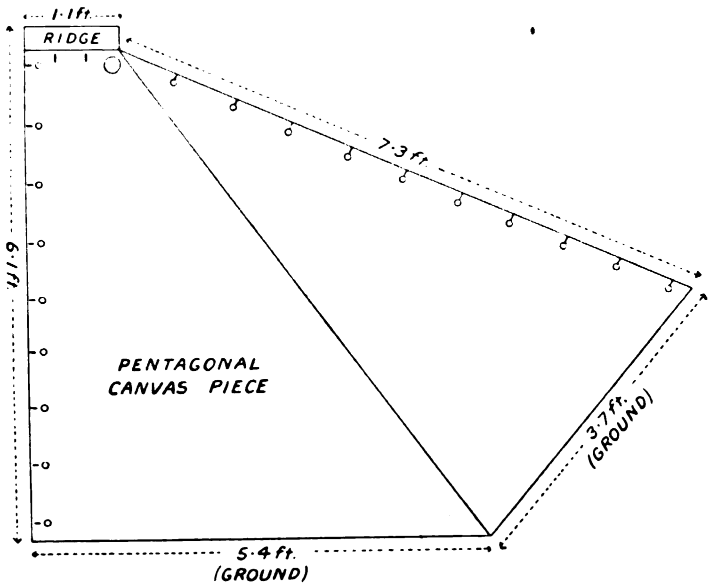


Plate IV.—Italian Shelter Tent (Bucciantini).

required to take the strain of keeping the tent erect. There are numerous buttons and button-holes along the edges; the majority are intended to button the pieces together, but some are to facilitate the use of the canvas as a poncho (Plate IV).

The edges of the two longest sides are provided with strips of canvas (3·2 in.) forming a gutter to carry off the rain-water.

The shortest side is provided with a similar strip to cover in the junction over the ridge pole with the opposing pieces. The tent when pitched encloses a rectangular area of 72 sq. ft.

The advantages claimed for the new pattern are :—

(1) Convenience with regard to normal sections of fours.

(2) The absence of tent ropes.

(3) Officers' tents are carried by men of their own unit and are therefore quickly available.

Russia.—Each man carries one-sixth part of a shelter tent (pattern 1909-10). The tent pieces made of 36-in. linen duck, coloured grey-green, are 66 in. square. They are treated by some water-proofing process. On each side of the sheet there is a 2¼-in. hem carrying six eyelet holes. At each corner are larger leather ringed holes to receive the pole ends. The poles, 45 in. in length, are made of two pieces of unvarnished wood, and are fixed together by a socket. Weather lines 80 in. in length, whipped at one end and eye spliced at the other, are provided to lace the sheets together. These lines are threaded through the eyelet holes and are then secured to the pegs in the ground. One man's portion consists of one tent piece, one pole piece, four wooden pegs, and two weather lines. Weight of a complete tent in detail :—

	lb.	oz.
6 sheets	14	0
6 pole pieces	2	13
10 weather lines	3	4
8 pegs	0	12
	20	13

A sixth share of this would weigh 3 lb. 7½ oz.

These tents are constructed by lacing four pieces together and arranging them over three complete poles in line. The two remaining sheets are folded double to form the gable ends.

The pegs and tent piece are carried by the men in the great-coat roll, the pole piece being strapped outside.

Norway.—The tent piece (Piedmont pattern 1908) carried by each man is in the shape of an equilateral triangle with 8 ft. 3 in. sides. It is made of grey water-proofed linen, and along each side are sewn metal hooks and eyes to join the pieces together. At two of the corners and along one side are fixed rope loops for pegging down the sides. The remaining corner has a hole to receive the tent pole. The pole is in four pieces, each piece has in the middle a slit through the wood to allow the insertion of a bayonet, &c., to form a cross piece for hanging up kit inside the tent. The pieces are joined together by aluminium sockets giving a total length of

6 ft. $4\frac{1}{2}$ in. Four tent pieces, hooked together and supported by the jointed central pole, form a tent for four men. A complete tent weighs $14\frac{1}{2}$ lb. One man's portion consists of one tent piece, one pole piece, three wooden pegs, and a guy rope, these weigh 3 lb. 9 oz.

The tent piece, rolled up, is secured by two straps to the bottom of the ruck-sack, and the pole piece is carried outside on the left-hand side. In winter these tent pieces are often made into big tents by hooking together some sixteen pieces, and stretching them

PLATE V.—Norwegian Shelter Tent (made with four sheets). Photograph.

over a frame of pine poles bound together at the top with wire, a sort of wigwam resulting. The pieces are left unhooked above so as to form a chimney. In the centre of the tent is suspended, by wires from the poles, a collapsible wire basket which forms a fire-place (Plate V).

Sweden.—The tent carried by the Swedes is identical with that of the Norwegians, except in one or two minor details.

The 1909 pattern has dark-green canvas pieces made of a heavier and stouter material. The pole pieces are a little longer and the jointing sockets are made of tin, the total length of the four pieces jointed together is 6 ft. 9 in.

Two pegs, instead of three, are carried, and no guy rope. One man's share weighs as follows :

	lb.	oz.
1 sheet	3	11·2
1 pole piece..	0	8·0
2 pegs	0	3·7
	4	7

The tent piece is carried folded on the top of the knapsack, the ends being folded over the sides. The pole section is carried strapped to the rear of the knapsack.

Spain.—The regulation *tente-abri* accommodates five, and if necessary six men. Both the tent and the pole are composed of five parts. Each N.C.O. and man carries one part in addition to two wooden pegs.

Weight per man :—

	lb.	oz.
1 tent piece	1	14
1 pole piece	0	14¾
2 pegs	0	2¾
	2	15½

The canvas is made into a roll and strapped to the sides and top of the knapsack. The section of the pole is strapped to the left-hand side of the knapsack.

Switzerland.—A section of a portable tent is carried.

Turkey.—Each Turkish soldier carries a fourth portion of a *tente-abri.*

U.S.A.—At present it is proposed to replace this article of equipment by a lighter form, but the old pattern will be described first.

With the 1907 equipment the tent piece served as a wrapper for the blanket roll. It is made of light brown waterproof canvas sheets, rectangular in shape, with a triangular flap on the shorter side. The dimensions are seen in fig. 1 of Plate VI. On one of the 65 in. sides are four canvas loops through which pass canvas straps 35 in. long. These straps are used to secure the blanket roll after it has been rolled. Along the free base and one side are shanked metal studs and button-holes by means of which the pieces are joined together. These metal studs or buttons are inserted through the material and then clinched, a method of fastening similar to the "bachelors' buttons" of commerce. The other side has three rope loops, and there is a fourth at the apex of the triangular flap by means of which the sides are pegged down. The supports consist of two three-jointed wooden poles measuring 46 in.

One man's share is made up as follows :—

	lb.	oz.
1 piece of canvas	3	2·00
1 three-jointed pole	0	14·76
5 pegs	0	7·75
1 guy rope	0	5·00
	4	13½

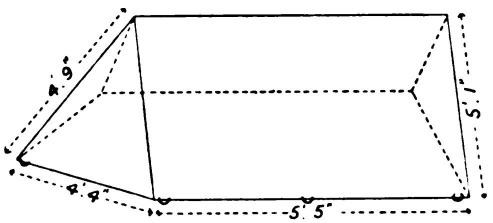


Fig. 1.—Single tent (diagrammatic).

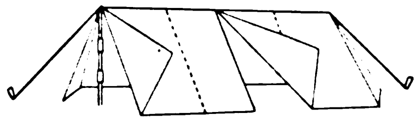


Fig. 2.—Double Tent (after Munson).

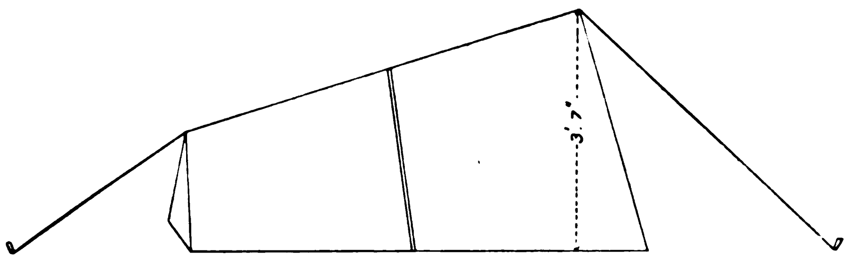


Fig. 3.—Proposed new type.
PLATE VI.—American Shelter Tents.

Munson[1] describes a similar tent which only weighed 3 lb. 4¾ oz. per man.

"Two tent pieces buttoned together at the ridge form a complete single tent. It is pitched on the two supports, and occupies a space of 64 by 76 in. When the two triangular parts are pinned to the ground an additional space 20 in. deep is enclosed. This method of pitching leaves one end exposed to the elements, but secures efficient ventilation.

[1] Munson, "Military Hygiene," 1901.

"A double shelter tent is formed by buttoning together the square ends of two single tents, two complete tents being used except for one pole and two guy ropes. Such a double tent, being closed at both ends, affords much better protection to its four occupants than does the single tent (open at one end) to its two occupants,[1] but allows no ventilation" (Plate VI, figs. 1 and 2).

The proposed new tent is made of material called Armstrong "Impervo," weighing 8 oz. per square yard. The pieces are so shaped that when pitched one end is wider and higher than the other. The smaller end is permanently closed, and the larger end can be closed by flaps which button back on the inside. At the large end there is ample space for the necessary movement of the two men occupying it, and the lower end affords sufficient space for their feet and legs. No poles are carried but the Springfield rifle with the butt on the ground, and the trigger facing outwards acts as the pole at the higher end raising the ridge to a height of 43 in. The entrenching tool is used at the other end for the same purpose, the tent sloping from front to back where the spade raises it to 22 in. In front a guy rope extends from the top of the rifle to a peg about 6 ft. away. Behind a similar rope runs back about 2 ft. from the spade, the two supports are themselves joined by a rope over which the two halves of the tent are laid and buttoned. Hook-shaped aluminium pegs are provided (Plate VI, fig. 3).

Tent pegs permanently attached to the tent pieces were tried, but field tests showed that in rolling up the tent for carrying damage was done by the points.[2]

Weight per man :—

	lb.	oz.
1 tent piece	2	7
5 pins	0	4·68
1 guy rope	0	5
	3	0

The Cavalry are to have a similar tent, erected by using the sabre as a tent pole. The proper height is obtained by placing an extra shelter pin under the bell mouth of the scabbard and supporting it on the hilt of the blade.[3]

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[1] Havard, "Military Hygiene," 1909.

[2] *Journal of the United States Infantry Association*, Washington, September, 1910.

[3] "Army and Navy Register," Washington, May 14, 1910, and October 28, 1911.

The tent and accessories in the new equipment are carried along with the blanket and poncho in the "pack-carrier."

Japan.—One portion of a shelter tent is carried by each soldier. The tent piece is made of a thin khaki drill rendered waterproof and measures about 4·7 ft. square. At each corner are large aluminium ringed eyelet holes to take the supports, and along each side there are similar smaller eyelet holes (twelve in number) for lacing the pieces together, small cords are attached to the sides for this purpose. The supports, made of wood, are in two pieces, jointing together by aluminium sockets, and making a pole about 2 ft. 8 in. long.

One man's share consists of one tent piece, two pole pieces and two pegs; these weigh about 2 lb. 5½ oz. N.C.O's do not carry a portion.[1]

Two of these portions pitched together provide shelter for three men. A larger number of pieces can be laced together after the German style, four pieces for six men and eight pieces for eleven men. The sheets are also used as a poncho in wet weather. Tent piece and pole are carried strapped to the top of the knapsack.

TABLE OF WEIGHTS.

Country	Weight per man lb.	oz.	Remarks
France	2	6½	—
Germany	3	8	—
Austria	2	14	—
Italy	2	3	Bucciantini.
Russia	3	7½	—
Norway	3	9	—
Sweden	4	7	—
Spain	2	15½	—
U.S.A.	4	13½	Old pattern.
"	3	0	Proposed pattern.
Japan	2	5½	—

PART III.

CONCLUSIONS.

From Part II. it will be seen that there are various methods of carrying the tent pieces and accessories.

Classification of the ways of carrying the tent pieces:—

(1) As a separate item on the knapsack (Norway, Italy, France and Japan.)

[1] Matignon, "Enseignements Médicaux de la Guerre Russo-Japonaise," Paris, 1907.

(2) Combined with some other article.
  (*a*) With the greatcoat on the knapsack (Germany and Austria).
  (*b*) With the greatcoat *en banderole* (Russia).

The plan of carrying the tent piece wrapped round the greatcoat on the knapsack as the Germans and Austrians generally do cannot be recommended. There must be many occasions when the greatcoat is required alone, and it cannot be readily detached from the knapsack on account of the tent piece covering it. The Russians carry their pieces with the pegs in the greatcoat roll, and suffer from a similar disadvantage. The contents of the new American "pack-carrier,"—i.e., poncho and blanket—are wrapped in the tent piece, and to remove the poncho would entail the unrolling of the "pack-carrier" bundle. If possible, the tent piece should certainly be carried as a separate item.

The accessories are best carried inside the knapsack. Where one man carries two or more pieces of a supporting pole, pieces are liable to be lost and the small pegs are also apt to be dropped. The German accessory bag is the ideal way of carrying these articles. It is better that each man should carry but one portion of a pole strapped to the outside of his knapsack (Norway and Sweden).

It is probable that in practice pegs, ropes, and even pole pieces are soon lost, and improvised supports, &c., are secured at subsequent camping grounds.

The absence of weather lines to a pitched tent is a great advantage, and the new Italian and Austrian tents are examples of this kind. Long guy ropes (6 ft.), such as are used for the new American tents, must be a great disadvantage in crowded camping grounds. The tents when pitched must be stable in wind, for this reason the lower forms of shelter tents are better. It should be noted that the Norwegian and Swedish tents are somewhat higher than those of other nations.

The use of the rifle as a support seems indefensible, although only one of the two occupants uses his weapon. When the support is a rifle with bayonet fixed "*en scabbard*" the owner must be handicapped in the event of a night alarm, as the rings of the tent piece, through which the bayonet scabbard passes, are likely to jam. The Americans argue that it is quite easy for a man leaving their new tent hurriedly to take the rifle away, and the tent collapses covering the contents. It would be interesting to hear the opinion of an Indian frontier officer on this method of support.

A few opinions for and against the use of shelter tents are here added. The evidence of the late war in Manchuria is in favour of their use, as the Japanese considered them indispensable, and "without these little tents Kawamowia's army would not have reached Mukden. It accomplished a twenty-five days' march in an almost deserted country, and with a Siberian winter temperature which was never above 15 degrees of frost. Again, during the burning days of the battle of Liao-yang the reserves sheltered themselves under these little tents."[1]

The Russians used them during the Russo-Turkish campaign of 1877-78, as it is recorded that "the half worn out shelter tents which the men had used during the summer were now cut up to tie around their boots."[2] This was the best use they could be put to under the circumstances, as the frozen ground during the winter precluded all ideas of tents.

Napoleon[3] in his "Memoirs" wrote, "Tents are not healthy, it is better for the soldier to bivouac, because he lies with his feet to the fire and protects himself with boards and straw from the wind. Moreover, the ground on which he lies, being near the fire, is quickly dried." In spite of such a pronouncement the French were the first to introduce them as part of the regular equipment of continental armies. However, the experiences of the Franco-Prussian War have led them to abolish its general use.

The reasons given by the German Minister of War in 1892, when the tent was adopted in that country, were as follows: "On account of the great increase in the numbers composing the field armies of the future, the cantonment will be the exception, while the bivouac will become the rule in the theatre of operations, thence the health and vigour of the troops must be guaranteed by sheltering them against cold and damp."[4]

Practically the same arguments were advanced by the Austrian authorities when a year later the introduction of the tent in the Austrian army was sanctioned. The cavalry and artillery were first supplied. The Italians are using such tents in Tripoli to-day.

For nearly two centuries the British soldier has done without such tents, and can be considered to have had experience of every variety of climate in all parts of the world. Our own climate at home alone is a liberal education in this respect. The old

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[1] Hehir, "Prevention of Disease and Inefficiency," 1911.

[2] Greene, "The Russian Army and its Campaigns in Turkey in 1877-1879."

[3] Krauss: "Bekleidung und Ausrüstung der Infanterie," 1907.

[4] *Revue militaire de l'étranger*, Nos. 774 and 779, 1892.

Peninsular surgeon, William Ferguson, writing on this subject, says, "Tents, when the soldier lies on the cold ground, with a crowd of comrades enclosed within a superficially heated atmosphere, loaded with animal exhalations, can only be considered hot-beds for the generation of dysentery."[1]

In conclusion, the advantages and disadvantages may be summed up. The chief object of the shelter tent is to assist in maintaining body temperature, an end which can be obtained either by assisting the production of heat or hindering its dissipation.[2]

Production of heat can be assisted by abundant food supply, and it is probably better under ordinary circumstances that a man should carry more food rather than his share of a shelter tent. The author (Bülow?) of the "Criticism of the Campaign in Germany of 1906-08" was certainly of this opinion, as the following extract shows: "I am convinced that one should do away with part of the field equipment, namely, the canvas roof that gives protection from the weather and which contributes far less to the health of the troops than good foods taken in abundance."[3]

At the same time food alone will not maintain body temperature during very inclement weather, and the soldier must be provided with some proper protection, which must be warm and to some extent waterproof. To prevent the dissipation of heat the only extra shelter which the British soldier carries is his greatcoat, and it is questionable whether the requirements just indicated are fulfilled by the present pattern.

The disadvantages of tents as an article of equipment are the extra weight to be carried by the soldier and the great difficulty in securing proper ventilation when they are pitched to afford shelter on all sides. The only advantage is the shelter provided.

The question is whether at the same or even less weight an equal amount of protection cannot be afforded by some means, free from the objections alluded to by Ferguson and others. Such means might consist in the provision of thick underclothing such as the "Iceland jacket" of the Norwegians, a sleeping bag as used by the same army, or some form of stout overalls such as are worn by motor-cyclists in combination with a shorter and more substantial greatcoat than the present pattern. The latter suggestion seems most promising and a point to be further discussed in a subsequent paper.

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[1] Parkes' "Practical Hygiene," 1864.

[2] Melville: "The Load of the Infantry Soldier," JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, vol. xvi, March, 1911.

[3] Krauss: *Loc. cit.*

United Services Medical Society.

THE SPECIAL WEAKNESS, FROM A MEDICAL ASPECT, OF VOLUNTEER TROOPS.

By Major H. E. M. DOUGLAS, V.C., D.S.O.
Royal Army Medical Corps.

The few remarks I have to make this afternoon are framed in no controversial spirit, but are rather offered in the form of a general talk on the differences, from a medical point of view, between Regular and Territorial troops.

To begin with I may state broadly, as a general proposition, that these differences are, from a military medical point of view, essentially due to the differences in the peace environment of Regulars and of Territorials, and to the effect of that environment on their physical and physiological condition.

The disease which above all others comes to one's mind in preparing for the assembly of any large number of troops is enteric fever. To-day it is by far the most important of the diseases which affect soldiers; whilst prevalent to some extent in garrisons, it is among soldiers in the field, and especially in camps of more or less permanence, that its greatest ravages occur. We must lay it down as an axiom that no camp of any size or permanency can be regarded as likely to remain immune from this infection. The ordinary conditions of life in military encampments and of troops in the field are such that infection has every opportunity for spreading.

In the American Army mobilized for the Spanish-American War during the summer of 1898, within the limits of the United States, that is in their home camps, 20,000 cases were registered. Nearly all the Regular regiments and 90 per cent of the Volunteer regiments developed this disease within eight weeks of going into camp.

In this war 88·55 per thousand of the admissions to hospital were from typhoid fever. The American Board which investigated the causes of this disease in "home camps" during the period of the war reported that not less than one-fifth of all the troops located in camps of mobilization had suffered from typhoid fever in either its recognized or unrecognized forms, and 8 per cent of the total mortality in these camps was due to typhoid fever.

The main preventive measure is, of course, inoculation; with Regular troops we can choose our time for inoculation, but there can be no attempt to inoculate Territorials before they are mobilized; directly they are called up, however, every effort will be made to induce them to be immunized against enteric fever. The symptoms produced by inoculation are so mild that the great majority of those treated would be able to continue their training without intermission. That this is so was well established in the case of the American troops who were patrolling the border during the last Mexican rebellion, after being inoculated they were able to carry on their work without a halt of any kind and suffered no ill effects. My own experience in the inoculation of troops bears out this very practical illustration.

If we may judge from the excellent results now secured among Regular troops by inoculation, there seems no reason why we should not be equally successful in dealing with the Territorials, and so banish a pestilence which up to the present day has decimated every army put into the field.

In one of our journals, under the heading of "No More Army Typhoid," the following extract [1] from an American source appears:—

"The rapid advance in army camp sanitation, and the value of vaccination, are strikingly set forth by a comparison of the typhoid incidence of the manœuvre camp with that of the 2nd Division, 7th Army Corps, which was organized in Jacksonville, Fla., and remained there until October, 1898, some of the regiments leaving camp in September. This division was not conspicuously fortunate in its typhoid record for the Spanish-American War, and is selected because of the close similarity of its conditions of service to those of the Manœuvre Division. The two divisions were located in nearly the same latitude, and for about the same length of time, and each had a good site and an artesian water supply of unimpeachable purity. While the period in camp of the 2nd Division, 7th Corps, was later in the year, the number of men involved is larger for the Manœuvre Division.

"While there were no deaths in the Manœuvre Division from typhoid, 248 were reported in the Jacksonville Division. Only one case of sickness from typhoid fever was reported in the Manœuvre Division, and that was a private of the Hospital Corps, who had not completed his immunization, having taken only two doses.

[1] Extract from *Army and Navy Journal*, August 12, 1911.

This case was such a mild one that really the Manœuvre Division should be given a clear record. In the Jacksonville Division 2,693 typhoid cases were reported, which was an excellent record for the Spanish-American War.

"At the time that the manœuvre camp was being kept free from typhoid fever, forty-nine cases, with nineteen deaths, were reported as occurring in the city of San Antonio. It is doubtful whether this record has ever been equalled in any army or any city of over 12,000."

I now go on to bowel complaints, of which the most frequently troublesome is diarrhœa. On service the usual causes are chills from exposure, irregular hours for meals, and food badly cooked. Needless to say physical condition has much to do with diarrhœa, and one would expect to find it much more prevalent among men yet soft from civil life.

Unfortunately, I have been unable to obtain comparative figures bearing on these diseases in campaigns in which non-regulars have served. It is well known, however, that when there are present any one or all of the above-mentioned exciting conditions, coupled with fatigue, enteritis is much more likely to fasten on an individual who has hitherto been a stranger to the hardships of exposure and to living in unaccustomed conditions. Perhaps the position may best be summed up by stating that the constitution of the regular soldier, from the very nature of his training, finds little or no difficulty in accommodating itself to conditions not unnaturally prejudicial to men less tuned to a high pitch of physical efficiency, and less accustomed to the various exigencies of camp life, wet, cold, irregular meals, excessive fatigue and indifferently cooked food.

Inconsiderable in its ultimate effects on individuals, yet productive of serious temporary interference with the efficiency of the unit in which they serve, the trouble of blistered feet in raw levies is very prevalent. For a time, especially at the beginning of a campaign, it may quickly reduce the total of effectives. Turenne estimated that after several days' marching about one-fourth of an infantry command would present excoriation of the feet, and military statistics in general show, also, that from 20 to 30 per cent of men sustain more or less injury to the feet as the result of a few days' marching, especially in the initial stages of their work. In the army of the Potomac whole brigades are said to have suffered temporary disablement from this painful trouble. The cause is clear and easy to detect, with few exceptions it may be traced to

ill-fitting and hard boots; here, again, the Territorial will inevitably suffer; as a rule Territorials never wear their military boots in civil life and often drill in their everyday boots. When, day in and day out, they have to use the hard military boot, abrasions are the natural sequel, and it is not until the seasoning of hard marching has done its work that the trouble disappears. The rubbing of the boot may be mitigated by softening the leather and so making it more easily take the shape of the foot. Old soldiers have many dodges for getting over the difficulty. One I can recommend from personal experience, and that is to fill the boots with castor oil, and at the end of a day put the boots on and wear them for an hour, in this way the softened boot moulds itself on the lines of the foot. When the boots are taken off the excess of oil is poured out and then the boots should be filled with bran; this not only trees the boot effectively but absorbs any excess of oil. But nothing is so true as the old adage "a stitch in time saves nine," and it may here be applied by careful and frequent inspection of both feet and boots, with the result that many a little abrasion will have no chance of becoming a bad sore. Should these abrasions occur, the methods of strapping the boot on to the foot, as described by Colonel Melville in a previous lecture before this Society, might very well be applied.

In comparing the relative efficiency of Territorials and Regulars nothing is more striking than the heart strain of individuals, considered from the point of view of physical fitness. To put it shortly, the soldier of worth must be tuned up to the highest pitch of physical efficiency. This in the case of regulars is done by a long course of gymnastic and other training, the weight and the response of the soldier to training being duly noted. Unpromising results in recruits are carefully noted down, and if, after a patient trial, a man fails to reach the proper standard of efficiency, out he goes. The Territorial inefficiency in this direction will only be discovered after mobilization, it may be after some days' work in the field, and then too often the damage is done. The previous environment of the Territorial is such that he cannot reasonably be expected to keep himself constantly in a physical condition sufficiently good to stand at once the rigours of a campaign. Even if gymnasia were provided, if drills were harder and more frequent, and the men more closely looked after, most of them could not spare the time to take advantage of these extra opportunities. Men physically soft, suddenly called upon to undertake long and unexpected exertion are, unless they possess unusual reserve of strength, more

than likely to develop some kind of heart trouble, temporary though it may be in many cases. This usually takes the form of heart-strain, and obviously a man so suffering becomes useless. Young soldiers are particularly liable, as also are men who have some form of latent cardiac weakness not discoverable by ordinary physical examination.

The only effective preventive work that can be done is careful and gradual training to the new condition of life, and the longer a preliminary camp lasts before the men go to their real work, the less likely are hearts to be affected by over exertion.

Since heart strain is caused mainly by over exertion, it may to some extent be prevented by minimising the load a soldier has to carry; this, of course must necessarily increase the impedimenta of the Army Service Corps. Another predisposing cause is mechanical compression of the chest, and therefore every care should be taken in the adjustment of straps, belts, clothing, equipment, &c.

Taylor says, that during the American Civil War, at Corinth, of two companies engaged in a lively reconnaissance, a quarter of the men returned to camp in a condition of complete exhaustion, and three dropped from the ranks with cardiac syncope, and were supposed to have died.

Again, speaking of one of the Civil War volunteer concentration camps, it is said that out of 4,901 men discharged, 1,123 men suffered from some form of organic, and 1,200 from functional, disease of the heart.

Lastly, I come to small-pox, and here we not only have to fight the disease itself, but also the crass prejudice of ignorance and crankiness.

In the war of the Revolution the failure of the American invading army to achieve the capture of Canada was largely due to the ravages of small-pox. In the American Civil War there were 18,962 cases, and 7,088 deaths. In the Confederate Army of North Virginia, from October, 1862, to January, 1864, there were 2,513 cases and 1,020 deaths. In the Franco-Prussian War, the German troops, who had been carefully vaccinated, had only 278 fatal cases in a total strength of 913,967. On the other hand, among the poorly protected French troops, the deaths were said to have reached 23,400 from small-pox alone. Constans states that during the siege of Paris small-pox mortality among the besieged troops was no less than 6 to 7 per cent of the total. The French profited by their misfortunes, and thereafter insisted on a vigorous system of vaccination.

The American troops on foreign service in the year 1898, during the war with Spain, consisted of troops hastily enrolled in an expanded and provisional army. These troops had a small-pox admission rate of 9·5 per 1,000. Contrast this with the 4·8 rate suffered by the Regulars fighting in the Philippines in the year 1899.

On joining the Colours the Regulars are carefully inspected and vaccinated, and their medical history sheets scrutinized at regular intervals; in the case of Territorials no special conditions are laid down as to vaccination or re-vaccination on their joining. Unfortunately the law of the country allows what it terms conscientious objectors to vaccination, and consequently it is more than likely that a fair number of Territorials have never been vaccinated, and of those vaccinated a large proportion have only been vaccinated once, in infancy. Therefore, unless we make a point of vaccinating Territorial troops in peace time we must expect an epidemic of small-pox in our next campaign, for the army will be billeted on the civil population living in the area of its operations, and these people are by no means immune.

In most cases the time between mobilization and active service is too short to allow of vaccination, so all we can do is to work hard to eradicate prejudice from among the civil population, and to make provision by teaching and encouragement for the re-vaccination of all Territorial troops on enlistment, as is done with the regulars.

I have limited myself to these few diseases as I consider them the most important and those which we shall all have to keep in mind during our next campaign, and I have carefully left out any reference to the differences from a strictly sanitary point of view, having kept myself confined to the purely medical side of the question. For I have no doubt that your secretaries will find some more able officer than myself to deal with that part of the subject.

DISCUSSION.

Major W. S. Sharpe, R.A.M.C.(T.) thought that the weaknesses to which Major Douglas had alluded, and which were undoubtedly present, were due primarily to the conditions of enlistment of the men; there was no compulsion, and the result was that one was limited in the choice of men, and the conditions of service had to be made easier than were compatible with real efficiency. The great inequality in the ages of men of the Territorial Force also served to make it difficult to attain to a high standard of physical efficiency. So far as he knew all men enlisted in the Territorial Force had been vaccinated in infancy, which would tend, at

any rate, to reduce the mortality from small-pox if epidemics arose. He had found that weak solutions of lactic acid (about 1 per cent) were useful as preventives of camp diarrhœa.

Major W. S. HARRISON, R.A.M.C., suggested that a good many of the bowel troubles of camp life could be reduced if men were practised more in the art of living in camp; he suggested that Territorial Associations might establish summer camps in suitable places where officers and men could go for week ends, as they would to an hotel, not so much for the practice of drills and such like, but simply to teach men how to live in camp, how to keep dry and warm, how to cook, and how to keep a camp clean; he thought it likely that such camps would serve as an additional attraction to the Territorial Force. Another means whereby the attractions of the Territorial Force might be increased, and at the same time the physical efficiency of the men improved, was the provision of gymnasia and swimming-baths. In this respect they might well take a leaf out of the Y.M.C.A. book. There was no doubt that the gymnasia, &c., of the Y.M.C.A. were a very great asset for attracting members.

With regard to boots it was worth considering whether Territorial authorities could not enter into arrangements with boot manufacturers for the provision of a good boot of a not aggressively military cut, which could be retailed to members at cost price. They would thereby be able to buy a good boot at much less cost than they would get it in the shops, and that would serve to induce the habit of wearing boots suitable for marching, &c.

With regard to small-pox, he had had the good fortune to have seen a very large epidemic of small-pox which was not controlled in any way by isolation. His impression was that, although infantile vaccination reduced the incidence enormously among children, and lowered the mortality rate of all cases, it had comparatively little effect in preventing infection among young adults, and, though the disease thus spread was not very fatal, an epidemic which involved a case mortality rate of 7 per cent was a very serious matter in an army in the field; on these grounds he thought that every effort should be made to secure re-vaccination of Territorial troops during peace time. It was impossible to do it after mobilization, for even if the Territorial Army had not to take the field for some months, it had still to carry out its training and look after its own interior economy, a thing which would be impossible if the whole of them were out of action with sore arms.

Captain G. L. LAWSON, R.A.M.C.(T.), supported the idea that revaccination in peace time was a necessity, and he quoted his experiences with the "Bushmen," where from one cause and another it had been found impossible to carry out re-vaccination after mobilization.

Major S. LYLE CUMMINS, R.A.M.C., did not agree that anti-typhoid inoculations could be done without, at any rate, temporary disablement; it was, of course, very necessary to carry out anti-typhoid inoculation,

but one must count on at least 50 per cent of the men being unfit for work for twenty-four hours. He thought it desirable that Territorial Officers should study the technique of inoculating large numbers of men. It was not a difficult matter, but there were a number of points which it was necessary to note in order to avoid mistakes and to carry out the inoculations rapidly.

Major G. A. Moore, R.A.M.C., said that the difficulties which Major Douglas had referred to were dependent on the difficulty of getting recruits. If we could get as many recruits as we wanted, we should be able to set a much higher standard of efficiency than at present.

Major Douglas, in reply, said that he had never known a man to need admission to hospital as a result of anti-typhoid inoculation. They might be somewhat seedy the following day, but they were all able to do their work at a pinch. What he had wished to point out was that the inefficiency following anti-typhoid inoculation was so transient that one could safely leave it till after mobilization, whereas the inefficiency after anti-small-pox vaccination lasted two weeks, and it was essential to secure that it was done before mobilization.

Clinical and other Notes.

REPORT ON THE CLINICAL VALUE OF BURRI'S METHOD OF DETECTING THE *TREPONEMA PALLIDUM.*

By Captain A. T. FROST.
Royal Army Medical Corps.

During the last two years experiments on Burri's Indian ink method of showing micro-organisms have been tried, with the idea of finding out if a rapid diagnosis of syphilis could be made practicable.

The variety of ink which gives the best results is the commercial waterproof Indian ink prepared by Gunter and Wagner, known as "Pelican" brand. This is rendered more homogeneous in the texture of the dark field by the addition of tincture of iodine, in the proportion of one part of iodine to six hundred parts of the ink.

During the last twelve months records of the number of times this method was employed have been kept, and during the last nine months both the Indian ink method and dark ground illumination have been done simultaneously so as to compare the methods.

(1) One hundred and sixty-five examinations have been made of all venereal chancres, irrespective of either appearance or history. Fifty-nine positive results were obtained. In forty-five cases of primary syphilis, thirty-eight gave positive results. The seven negative cases were accounted for as follows: Two were phagedænic, two were suffering from gonorrhœa and had permanganate of potassium applied to the sores during irrigation, the three remaining cases had used a mercurial preparation, usually "lotio nigra." With reference to the application of mercurials locally to chancres, two points were noted. One is that in most chancres *Treponema pallidum* may be demonstrated, even though mercurials are used, if a week is allowed to elapse between the last application, and only hot water bathing of the sore is prescribed. This procedure has been successful in at least six chancres.

The second point, though hardly relevant, has an important bearing on the question of syphilis prevention, and the cure of syphilis in the primary stage. Men provide themselves with 30 per cent calomel cream for the prevention of venereal disease. In addition to using this ointment at the time of running the risk of infection, they apply it to the developed chancre—some only rub in the cream at this, too late, stage—and in consequence their treatment sometimes has to be delayed for at least a week, or in some cases until either the blood becomes positive to the Wassermann reaction or secondary signs supervene.

(2) In one hundred and twenty-four examinations of serum from

venereal sores, both the Indian ink method and dark ground illumination were employed in each case to compare the methods. Sunlight was the means of illumination employed with the dark ground condenser, and, although one had to watch for the appearance of the sun on a dull day, few days occurred in which the sun could not be utilized for a short time. The conclusion arrived at is that little difference exists between the two methods. The dark ground illumination gave a positive result on two occasions, in which the ink gave a negative one. And on one occasion the ink method was positive when the "dark ground" failed to show any Treponemata. The time taken to find the organism varied from at once in most cases to twenty minutes, the longest time to obtain a positive result. The average time has been one minute in diagnosing the last thirty syphilitic sera.

(3) The success of Burri's method depends on the even distribution and the requisite thickness of the film (consisting of two parts of Indian ink to one of serum from the chancre), and the absolute freedom of the slide from grease.

Lastly, it has been noted recently that when both *Spirochæte balinitidis* and *T. pallidum* are mounted on the same slide with ink that there is much more distortion of *S. balinitidis* than of the *T. pallidum*, probably owing to the greater resiliency of the curves of the latter organism. This point requires further investigation, for if it is true it enhances the value of Burri's Indian ink method of diagnosis in syphilis.

BIER'S HYPERÆMIC TREATMENT: A PLEA FOR ITS MORE EXTENDED USE.

By Captain V. T. CARRUTHERS.

Royal Army Medical Corps.

Professor Bier introduced his hyperæmic treatment in 1892. It is surprising that its progress in public esteem has not been more rapid.

The writer has used it for the last eight years—his first patient being himself with a poisoned finger when he was a house surgeon. The treatment consists of three different systems: (*a*) elastic compression proximal to the lesion; (*b*) suction by vacuum-glasses; and (*c*) hot-air appliances. Of these the first is by far the simplest, and, on account of the cost of the apparatus required for the other two, elastic compression is practically the only method of producing hyperæmia that the military surgeon can consider at present. In any case he will probably have to buy the elastic for himself; but the satisfactory results will amply repay him for the small outlay.

It is not proposed here to give any detailed description of the treat-

ment, but merely to sketch the outlines of the method of using the elastic band, with some practical hints that the writer believes in, but which are not commonly mentioned by the authorities. There is now an excellent English translation of Bier's book, and numerous articles have appeared recently by British surgeons, notably by Mr. Waterhouse. This surgeon has also written a concise and lucid summary of his experience for Hutchison's and Collier's "Index of Treatment."

The type of case for which hyperæmia will be chiefly used in military practice will be septic conditions of the extremities. Professor Bier advocates it for tuberculosis of joints, lungs, skin, &c., chorea, coryza, scoliosis, varix, and innumerable other diseases. It is possible that the bulk of the profession will not be able to follow him into every branch of healing. We must take into account his exceptional skill and experience; and even (if such a thought may be for a moment hinted at) we may make a little allowance for the zeal of the inventor. The method has been extolled as the greatest surgical discovery since Lord Lister's; at any rate, we can say that surgeons of experience who have given it a fair trial speak very highly of its virtues.

Let me, then, mention some details which may help the inexperienced to make a start. All that is required for a beginning is some two or three yards of garter elastic. With this the treatment of septic infection of the limbs can be quite effectively carried out. Any stronger elastic bands are to be condemned. A practitioner with experience of the method may use broad elastic webbing or rubber tubing with safety and success, but in the hands of a beginner great harm may, and often has been known to, result from their employment.

The band should be applied to the arm above the elbow and to the lower extremity above the knee. Even if the lesion is an onychia this rule holds good. The reason being that more blood can be caused to enter the inflamed area by congesting the whole limb than by causing hyperæmia of a part only.

The degree of tightness should be such that the limb becomes gently congested and dusky; but it is of supreme importance that the arterial flow be not stopped. Within a short time pain should be relieved. This is one of the golden rules. If pain is increased at the end of, say, half an hour, one of two things is wrong; either the band is too tight or else there is pus under tension. Pus under tension must be let out. A very much smaller incision may be used for this purpose than could be allowed without congestive treatment.—the object being merely to relieve tension. Bier says that the tiny incisions of the general practitioner are converted by hyperæmic treatment from bad into good practice. However, this is a statement that need not be too much emphasized at present. Everybody knows what hideous suffering timid incisions may give rise to in septic conditions, and large incisions are always safest whatever auxiliary treatment is used.

If, therefore, pain goes on increasing for half an hour after the application of the congesting hand, it is necessary gradually to slack off the constriction until pain ceases. If pain will not cease or abate until all constriction is removed, then pus is almost certainly present, and should be let out. After incision the band is re-applied, and it will be found to ease the pain. In addition a very copious discharge of serum will be caused, so that fomentations under waterproof may often be discarded, as the serum keeps the dressings moist. If in any case there should be free venous hæmorrhage the congesting band should not be applied until some hours have passed, for it is plain that the flow of blood from a severed vein must not be aggravated. As to the time per diem that the elastic should be worn opinions differ. Professor Bier advocates twenty hours out of each twenty-four, but English writers do not keep to this rule, and seem to obtain good results even with two hours' application morning and evening. The writer generally keeps the constriction on all day and removes it at night. The merits of each case of course have to be considered. We are now, let it be quite plain, discussing acute septic conditions only. For the treatment of tuberculosis, rheumatism, &c., the rules are different and cannot be considered here.

The effect of the congestion is to cause a considerable and alarming œdema. This is a laudable condition, and should not cause anxiety. After the constriction is removed the limb must be elevated on pillows until the time for re-application of the elastic comes round. This is a very important part of the treatment, and must be carefully remembered. As much as possible of the œdema should be in this way daily, or rather nightly, removed. If it does not entirely disappear it does not matter.

To produce the above effects a yard of garter elastic will be enough for most arms and about twice that amount for the thigh. It should be applied over a fairly broad area of skin in order to prevent deep pitting of the tissues. Those who are inexperienced in the treatment should see their patient very frequently while the congestion is present, and test the pulse and general condition of the limb. After some experience two visits a day, once to apply and once to remove the bandage, will be enough.

In chronic septic trouble the congestion may be more severe and of longer duration, and the most excellent results may be anticipated.

As for the second method, i.e., suction by cupping glasses, something may be done, even without the regular apparatus, by the judicious use of the common breast-pump and cupping glasses in such diseases as boils and persistent sinuses. The writer used a common ball breast-pump with almost dramatic effect in curing a case of inveterate sinus following liver abscess and empyema, in which all his labours at the operation were in a fair way to be forgotten by his patient on account of the refusal of the tube-track to heal.

A somewhat severe, dry cupping will also sometimes heal a chronic sore or sinus that has resisted months of other treatment.

Of the use of the congesting glass to the penis in anterior urethritis, the writer has no personal experience, though he hears excellent reports from his civilian friends.

In conclusion, these notes are not intended to instruct those who already use the hyperæmic treatment, but to encourage those who have not yet begun it to make a start.

The references to Professor Bier's opinions have throughout been taken from the French translation of the fourth edition of his "Hyperämie als Heilmittel." The later editions are not at present accessible to the writer.

FRACTURE OF THE ASTRAGALUS.

By Major W. J. P. ADYE CURRAN.
Royal Army Medical Corps.

Recently five cases of fracture of the most posterior portion of the astragalus have come to my notice. Attention was directed to the first case owing to the severity of the apparently sprained ankle, following a comparatively small degree of violence, viz., kicking a football.

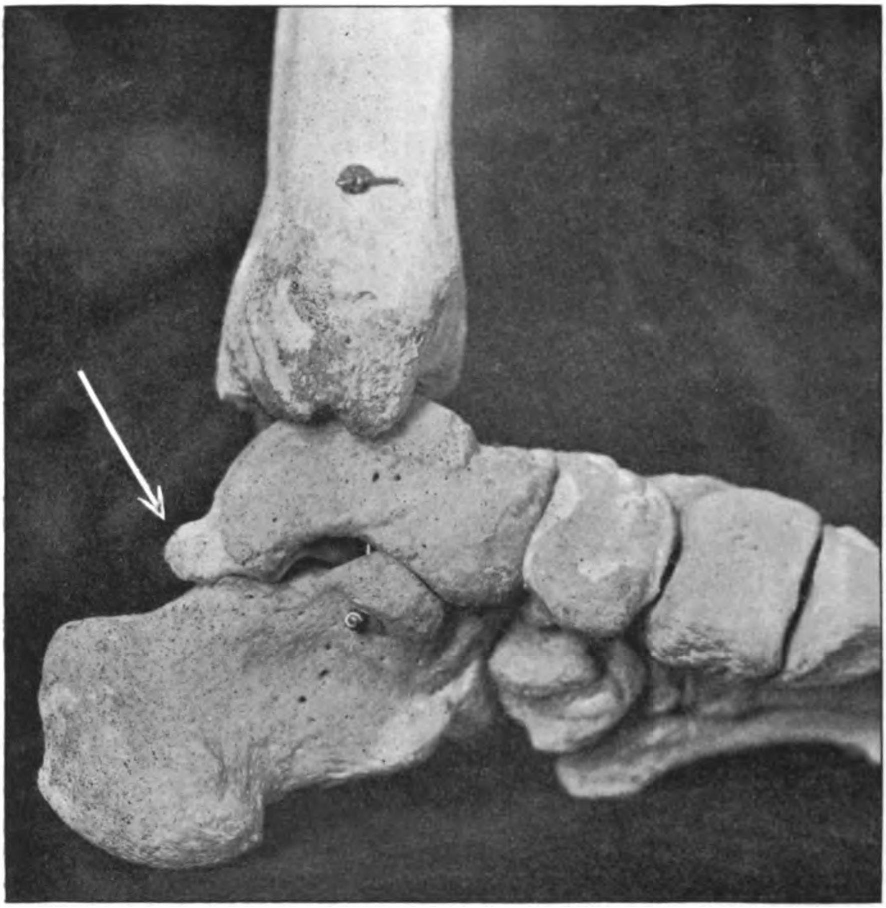
Subsequently the other cases were detected by examining all skiagrams of sprained ankles admitted to hospital. The mode of injury in these cases was falling down steps, twisting the ankle by stepping on a stone whilst walking, alighting on the heel on a tuft of grass in jumping over an obstacle. In two of the cases the patients had apparently been well for some time, but on walking they complained of pain at the seat of injury, and an examination by "X" rays revealed a fracture.

The portion of the astragalus broken was the small posterior process which articulates with the os calcis below, and is grooved on its upper portion for the tendon of the flexor longus hallucis. The fracture involved the joint. Swelling was particularly noticeable on either side of the tendo Achillis. In one case only was the whole process broken off.

The fracture seems most likely to occur when the foot is hyperextended and violence is at the same time applied to the heel, or dorsum of the foot, driving the os calcis upwards. In this position the astragalus is kept fixed by the tibia and the small process of the astragalus is unsupported, and therefore in a position to be easily broken off by the os calcis being driven upwards.

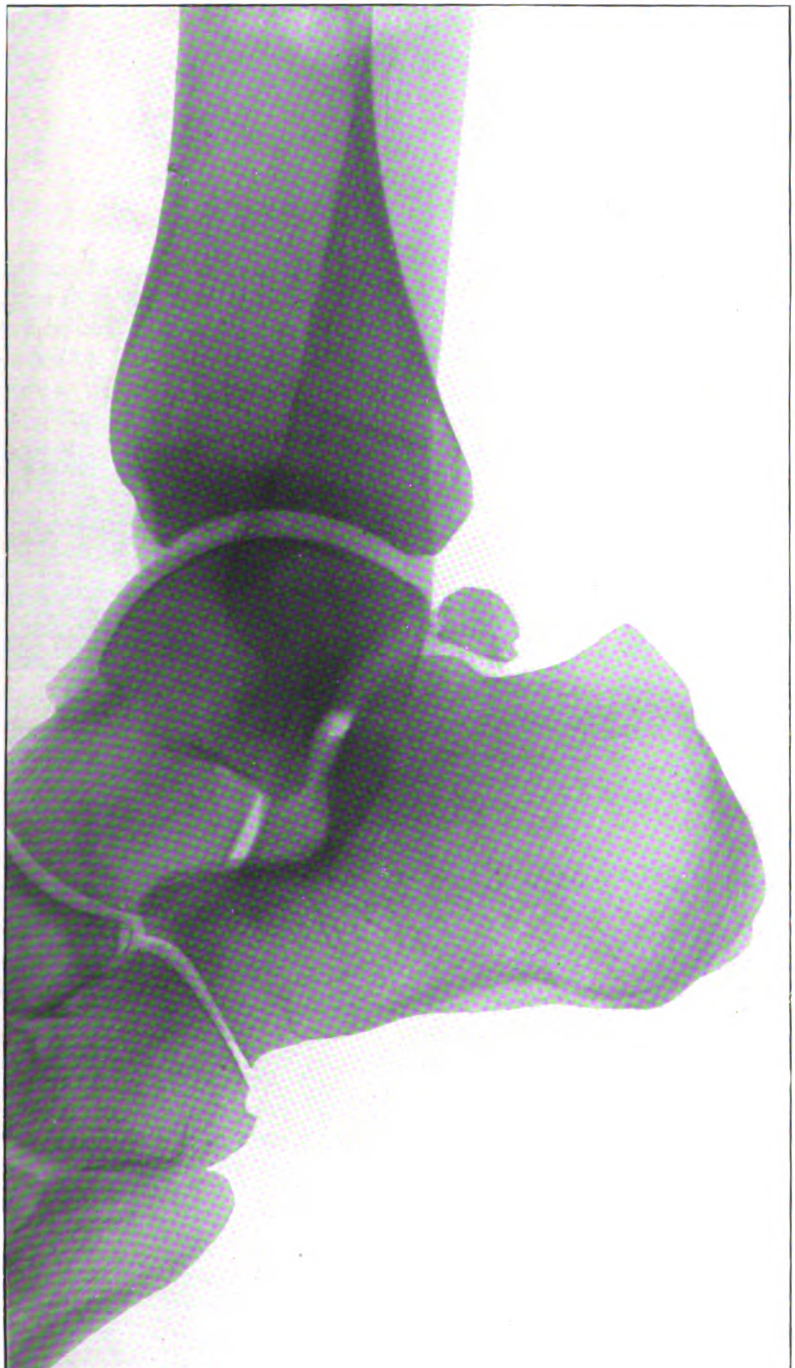
As I have not seen the condition specially mentioned, it would be interesting to know if the fracture has been noticed by others, as it seems possible that some of the severe sprains which do not easily yield to treatment, and where the pain persists, may be due to this cause.

The accompanying skiagram shows the most marked case, and the photograph of the skeleton foot shows the process which becomes fractured.



Photograph of the bones of the foot; the arrow points to the process which is liable to fracture.

I am indebted to Lieutenant-Colonel J. Meek, R.A.M.C., Officer in charge, Alexandra Hospital, Cosham, for permission to publish this note.

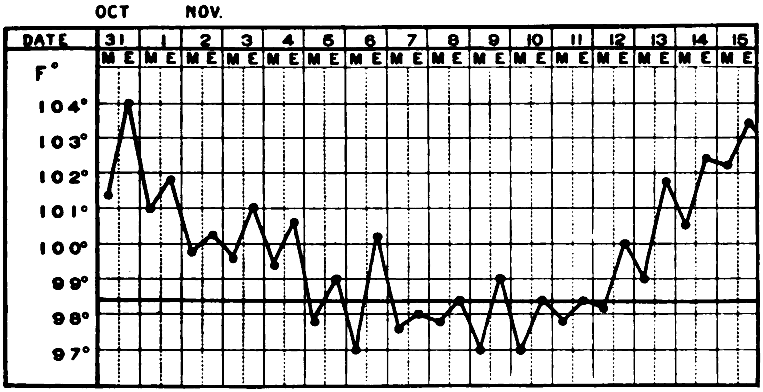


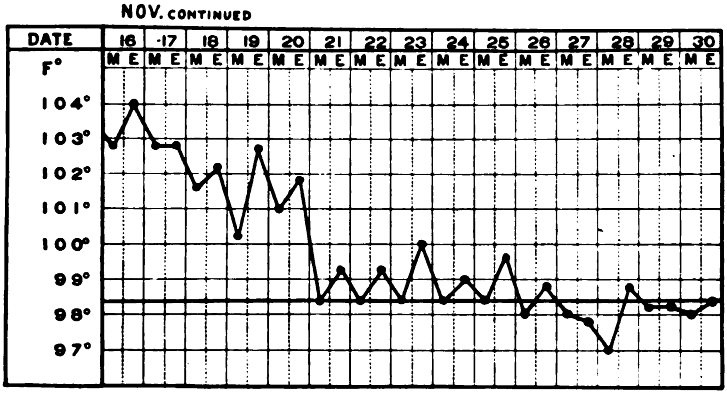
To illustrate "Fracture of Astragalus."
By Major Adye Curran.

SOME OBSCURE FORMS OF FEVER IN NORTH CHINA.

By Major A. C. FOX.
Royal Army Medical Corps.

During the past three years I, in common with other officers of the Corps in Tientsin, North China, have been much puzzled by a type of fever which has been fairly common amongst the European troops in this station. The native troops were exempt.



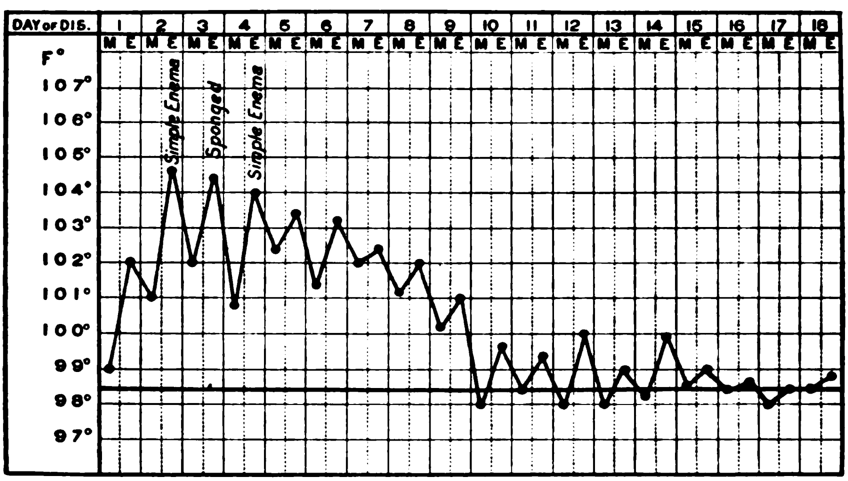


There have not been any of these cases during the present year (1911) in the garrison, and I am informed by one of the civilian medical practitioners that there have been very few cases among the civil population.

The disease was frequently met with during the autumn of 1908 and up to the end of the year 1910. It is well known here amongst the civil

community, and is spoken of as "ten day fever," but the actual cause of the fever has never been discovered.

The disease is characterized by the following signs and symptoms, the first five being invariably present in all cases: (1) Fever of a remittent type; (2) frontal headache lasting from two to three days; (3) constipation; (4) furred tongue; (5) slow pulse (comparatively speaking). In addition a few of the cases complain of abdominal discomfort, amounting in some cases to pain; others have complained of pain in the back, chiefly in the lumbar region, but the two last symptoms only occurred in a minority of cases. One of the most remarkable characteristics in the course of the disease was the small amount of disturbance in the general health of the patient. After the first two or three days of the



fever, and almost invariably after the disappearance of the initial headache, if the patient was asked how he felt, he answered "all right," and usually asked to be allowed up and given extra food, though at the time the thermometer would record a temperature several degrees above normal. The fever generally lasted from ten to fourteen days. Relapses were rare, and I have not seen a second attack occur in the same individual, nor have I heard of a fatal case. The onset of the disease was sudden in all cases. There were no premonitory symptoms. The face on admission was flushed, and the expression dull and heavy.

These cases have been met with at all seasons of the year, even during periods of severe cold, but they were most commonly seen during the months of August, September, October and November, during and after the rainy season, and also at a period when flies were most troublesome

No malarial parasites were found in any of the cases, and quinine internally had no effect whatever on the course of the disease. Sandfly fever was excluded, both by the course and symptoms of the disease, as well as by the absence of the causative agent.

Recently I have been struck by the similarity of this type of fever to one described in some recent numbers of the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS by Colonel Firth and other officers, under the heading of "Paratyphoid Fever," and attributed by them to infection by the *Bacillus paratyphosis A*. The symptoms and course of the disease as described in the Journal are practically identical with those met with in Tientsin, and which, up to date, have been returned under the heading of "Pyrexia of Uncertain Origin." Owing to the absence of any laboratory in North China, it has not been found possible to carry out the necessary technique required in an examination of the blood to isolate the bacillus. If, however, any further cases should be met with, it might be possible, by sending down specimens of blood to the Shanghai Municipal Laboratory, to further investigate these cases and, if possible, discover their true nature.

Many of the soldiers who were down with this fever last year had been quite recently (within twelve months) inoculated against enteric. Therefore it would seem that anti-typhoid inoculation conferred no immunity on the individual against this type of fever. The convalescence of these cases has always been rapid and uninterrupted.

A REVIEW OF THREE YEARS' SURGICAL WORK AT LUCKNOW.

BY MAJOR F. E. GUNTER.
Royal Army Medical Corps.

OPERATIVE surgery in this station is limited when compared with the work done at a large military hospital at home. In the first place many operations, such as radical cure of hernia, removal of varicose veins, and so on, are not often required, as the majority of cases are discovered before leaving England and are dealt with there. Then, again, it is only during the cold weather that many operations are performed. During the summer months the climate of Lucknow is extremely trying, so operative treatment during this season is, if possible, avoided. Altogether 225 major operations have been performed; of this number, 187 are what I call, for want of a better term, "routine operations," that is to say, the ordinary operations that one is called upon to do any day in a military hospital. The remaining thirty-eight were operations of more or less difficulty, and

I do not propose to deal with them now, as the object of the present article is to describe the general method of work in the surgical department of the hospital, rather than to go into details of cases.

Lieutenant-Colonel Thompson, the officer commanding the hospital, holds strong views, with which I thoroughly agree, regarding the rôle a surgical specialist should fill in a military hospital. He considers that the surgical specialist should be responsible, certainly, for all surgical work done; but, that his chief function should be to assist and help other officers with operations. In other words, he should be a teacher. He maintains that as many officers as possible should learn to do routine operations; and that it is not so much the few so-called experts that we require in the Army as many well-trained surgeons, who can do any simple operation that may be wanted.

For this reason he attaches a junior officer for about six months to the surgical wards. This officer has charge of the wards, working under the surgical specialist. The general plan is for him to assist at operations at first, and, when he has learnt the methods, to do most of the "routine operations" himself.

The following are considered "routine operations": Hernia (radical cure), appendicectomy, evacuation of liver abscess, removal of loose cartilages, hydrocele, varix, and varicocele.

Technique.—We carry out much the same methods here as I described in the Journal a few years ago, and I do not propose to go into the matter further, beyond saying that tincture of iodine is now the only preparation used for the skin, and that beyond this no dressing is, as a rule, applied to the wound in aseptic cases.

Anæsthetics.—Chloroform has been given in the majority of cases. It has been used nearly 1,000 times without a casualty. Practically all extractions of teeth are performed here under chloroform. The routine is for the man to be detained for the day before, and to be "prepared" as for a major operation. This is, in my opinion, essential. Anæsthetics are given by all officers in turn.

Surgical Dressing-room.—When going over a hospital in Japan some years ago, I noticed that no dressings were done in the wards. They were all performed in a special dressing-room. The idea struck me as good, and I determined I would adopt it when I had the chance. It has the following advantages:—

(1) The ordinary work of the ward is not interfered with.
(2) It does away with the necessity of screens.
(3) Dressings and instruments are more directly under your eye.
(4) It is a great saving of time.

Patients who cannot walk are brought down to the dressing-room on a stretcher. They are dressed under supervision by the assistant-surgeon in sub-charge of the ward. An orderly is in charge of the dressing-room, which is equipped with the necessary instruments, &c. At the end of the

morning's work the room is cleaned, fresh dressings put out, instruments are boiled, the room locked and the key handed over to the assistant-surgeon on duty. In this room he also treats all surgical emergencies that may occur during his tour of duty.

Technique.—The same principles are applied as in the theatre, that is to say, everything is freshly sterilized daily, oftener if necessary. A few simple hints to orderlies are hung up in the room, and are closely adhered to. In these hints it is pointed out that all cases, whether suppurating or not, should be treated with the same attention to surgical cleanliness; that no wounds should ever be handled; how to render instruments aseptic by "flaming," and so on.

Bier's Method.—The following general principles of treatment are observed: In septic wounds Bier's bandage or cupping is applied, $\frac{1}{3}$ of a Martin's bandage is quite long enough for the venous congestion treatment. For cupping, the ordinary wet cupping apparatus is used, but an aspirator is found more convenient for exhausting the air than the ordinary cupping pump. During intervals of treatment hot fomentations are applied.

Salt Solution.—This is used in lieu of, or in addition to, Bier's treatment. The solution is that recommended by Sir A. E. Wright—viz., 2 per cent sodium chloride and 0·5 per cent sodium citrate. The rationale of this treatment is as follows: The sodium citrate attracts the leucocytes to the part, and the sodium chloride increases their phagocytic action. The results are excellent, far better than can be obtained by antiseptics. In certain cases it has been found necessary to employ vaccines, but in most cases healing is satisfactory under the above methods of treatment. Salt solution is difficult to keep aseptic. It will not keep sterile for long if exposed to the air. The method we adopt here is to keep the solution in a copper receptacle. This vessel is a cylinder of the capacity of a quart, fitted with a tap at the bottom. It has a deeply flanged removable lid, which is secured back and front to the cylinder by padlocks, the keys of which are kept by the theatre orderly. The latter fills the cylinder, places it in the Thresh disinfector, and, after sterilizing it, puts on the lid, locks the padlocks, and issues the cylinder to the dressing-room. A couple of these cylinders are in use, which allows for re-sterilizing daily.

Saline Ointment.—For burns and abrasions, in fact any wound which requires a non-adherent dressing I use the above-mentioned ingredients in the form of an ointment, made up with boiling vaseline. This is spread on suitable-sized pieces of lint, which are put up in cigarette tins and sterilized in the Thresh disinfector before being issued to the dressing-room. When wounds or abrasions become aseptic they are closed with collodion.

Surgical Out-patient Department.—This is an important adjunct to the surgical department of the hospital. It is much more satisfactory

to treat slight surgical cases at the hospital than in the inspection rooms in barracks. The work is done in the dressing-room described above. The system of working is as follows: All cases first attend the medical inspection rooms in the lines. Should the medical officer in charge of the latter consider a man requires surgical treatment, he writes on the sick report "attend station hospital." The man's name is then taken off the sick report and placed on the roster of those attending the hospital out-patient department, and he is kept on this until fit for duty. Cases from distant barracks are brought to hospital in a tonga. About 1,000 fresh cases per annum attend the surgical dressing-room as out-patients, and it has fully justified its establishment.

AN INVESTIGATION TO DETERMINE CERTAIN CHARACTERISTICS IN THE PHYSICAL EQUIVALENTS OF LANCASHIRE RECRUITS.

By S. T. BEGGS, M.B., M.D.
Capt. Royal Army Medical Corps (Res. of Officers).

My attention has been drawn to the low weights prevailing in this district in normal healthy individuals. This is noticed in school children, e.g., at age 7, although the height is slightly above that seen in children of the same age, taken as a whole, in Great Britain, the weight is very much below that of the average of the whole country. Again, the same thing is seen at age 13, the height at this age being about the same as in children throughout the country:—

Age in years	Height		Weight	
	Great Britain	Burnley	Great Britain	Burnley
7	44·60	45·60	50·70	45·70
13	55·81	55·10	79·0	75·3

No records are available to compare ages from 14 up to 17.

In the following analysis 918 recruits found medically fit are taken as the sample. They are taken from the periods 1907-11, and the results obtained are compared with the official figures as published by the War Office for the year 1909.

All the recruits under review were born in Lancashire, and were resident in the recruiting area of Burnley and district.

Burnley may be taken as a typical industrial centre having a population of over 106,000, of whom 30,000 are engaged in cotton weaving, over 4,000 in coal mines, over 2,000 in ironworks, and about 2,500 in building and works of construction. Of the 918 recruits under review

33·33 per cent were unskilled labourers (4·9 per cent casuals); 54·47 per cent. were skilled labourers (12·85 per cent miners; 31·6 per cent factory workers; 10·02 per cent various); and 12·2 per cent were occupations classified separately.

The town is situated above sea-level, in the lower parts 300 ft. and in higher parts 775 ft. It is built on a clay subsoil and the rainfall amounts to 40 in. The atmosphere is smoky.

The housing is fairly good. Half time labour in the mills prevails. Wages are good.

The conditions seen in the factories are not always conducive to health, *e.g.*, the state of the atmosphere may be dusty or humid with steam, there are extremes of temperature, long standing and over-fatigue have their effects.

The feeding of children and youth is not insufficient, but the food in many cases is highly improper. There is a prevalence of tea-drinking, mostly taken without milk. Pastry, white bread, jam, pickles, &c., take the place of more nourishing articles of diet. Potatoes and fish cooked in fat are common dishes.

Alcoholism and venereal diseases are not prevalent.

The district surrounding Burnley is partly rural and partly urban, and the conditions of life are much the same as in Burnley.

The following investigation deals with an analysis of the "physical equivalents" in recruits passed medically fit.

It will be noted that the variability from the mean is less in Lancashire recruits, and that the weight is less by 4½ lb. as compared with the generality of recruits. It is remarkable that in the school children at ages 7 and 13 a low weight is also seen.

Another remarkable difference will be noted in the fact that although the height, weight and chest measurements are less in the sample of Lancashire recruits under review, the range of chest expansion in the same sample of recruits is greater than in the all-country recruits.

In the following tables an analysis of the physical equivalents in 918 Lancashire recruits found physically fit, and a comparison with the official figures for 1909, with the conclusions derived therefrom, is given:—

TABLE I.—Frequency Distribution for Age.

Ages in years	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	
Totals ..	2	140	363	178	97	55	34	18	14	17	918

Mean age (Lancashire)	19·39 years.
,, ,, (all recruits)	19·55 ,,
Standard deviation of age (Lancashire)	1·72
,, ,, ,, (all recruits)	1·79

Conclusion.—The Lancashire recruits are slightly younger than the generality of recruits, the difference being 0·16 of a year, or about $\frac{1}{10}$ of the standard deviation. The ages are distributed about the mean nearly alike in both cases, the Lancashire recruit being slightly less in variability from the mean.

TABLE II.—CORRELATION OF HEIGHT WITH AGE.
The frequency of height is shown at each age in this Table.

Heights	Under 17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	Above 25	Total at each height	Percentage at each height
Under 5 ft. 2 in. ..	1	..	1	1	..	..	..	..	..	..	3	·32
5 ft. 2 in. to 5 ft. 3 in.	1	26	40	13	8	3	1	1	..	1	94	10·32
5 ft. 3 in. to 5 ft. 4 in.	..	38	81	33	25	4	7	2	3	1	194	21·24
5 ft. 4 in. to 5 ft. 5 in.	..	34	90	36	12	8	9	3	3	3	198	21·66
5 ft. 5 in. to 5 ft. 6 in.	..	29	58	43	15	12	5	1	2	1	166	18·18
5 ft. 6 in. to 5 ft. 7 in.	..	7	44	27	15	10	5	4	2	4	118	11·77
5 ft. 7 in. to 5 ft. 8 in.	..	5	29	15	14	6	1	4	..	2	76	8·28
5 ft. 8 in. to 5 ft. 9 in.	..	1	15	7	3	7	3	2	1	3	42	4·68
5 ft. 9 in. to 5 ft. 10 in.	..	..	3	3	2	4	2	..	3	1	18	2·56
5 ft. 10 in. to 5 ft. 11 in.	..	..	1	..	2	1	1	1	..	..	6	·66
5 ft. 11 in. to 6 ft. ..	..	..	..	..	..	..	..	..	..	1	1	·11
6 ft. and upwards ..	..	..	1	..	1	..	..	..	..	..	2	·22
Number of observations at each age	2	140	363	178	97	55	34	18	14	17	..	..

Mean height (Lancashire) .. .. 65·10 in.
,, ,, (all recruits) .. .. 66·22 ,,
Standard deviation of height (Lancashire) .. .. .. 1·69 ,,
,, ,, ,, (all recruits) .. .. .. 2·21 ,,
Co-efficient of correlation of height with age (Lancashire) 286 ± 0·020 in.
Correction in height for each year of age (Lancashire) .. 0·28 in.

Conclusion.—The Lancashire recruits are shorter than the generality of recruits by 1·12 in., or half of the standard deviation of all recruits. This is a considerable difference; the less age of Lancashire recruits in this table accounting for only 0·04 in. (i.e., 0·16 × 0·28 in.), leaving 1·08 in. as the balance of difference apart from the difference in age. The variability of height is also considerably less in Lancashire recruits, i.e., the latter are more uniform in height.

TABLE III.—CORRELATION OF WEIGHT WITH AGE.
The frequency of weight is shown at each age in this Table.

Weights	Ages in years										Total at each weight	Percentage at each weight
	Under 17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	Above 25		
Under 100 lb.	1	..	..	..	..	..	..	..	..	..	1	0·11
100—110 ,, ...	1	54	61	7	..	..	..	..	..	..	123	12·32
110—120 ,, ...	..	58	142	42	21	12	4	3	2	5	289	31·33
120—130 ,, ...	..	20	122	67	31	16	9	3	2	2	272	29·64
130—140 ,, ...	..	7	28	43	33	15	13	7	5	3	154	17·79
140—150 ,, ...	..	..	6	14	10	7	6	3	3	3	52	5·75
150—160 ,, ...	..	1	3	4	1	4	..	1	2	1	17	1·96
160—170 ,, ...	..	..	1	1	..	1	2	..	..	1	6	0·66
Up 170 ,, ...	..	..	..	..	1	..	..	1	..	2	4	0·44
Number of observations	2	140	363	178	97	55	34	18	14	17	918	100

Mean weight (Lancashire) .. .. 122·98 lb.
,, ,, (all recruits) .. .. 128·13 ,,
Standard deviation of weight (Lancashire) .. .. .. 12·29 ,,
,, ,, ,, (all recruits) .. .. .. 16·38 ,,
Co-efficient of correlation of weight with age (Lancashire).. 0·506 ± 0·017
Correction in weight for each year of age (Lancashire) .. 3·61 lb.

Conclusion.—The Lancashire recruits are lighter than the all-country recruits by 5.15 lb. or by $\frac{1}{3}$ of the standard deviation of the generality of recruits. Allowing for the less age in this table which accounts for ·58 lb. (i.e., 0·16 × 3·61 lb.), the characteristic difference in weight amounts to 4·57 lb. Again the variability in weight is less in the Lancashire recruit, i.e., the weight is more uniform than in the all-country recruits.

TABLE IV.—CORRELATION OF MAXIMUM CHEST EXPANSION WITH AGE.
The frequency of maximum chest expansion with age is shown in this Table.

Maximum chest measurements	Age in years										Total	Percentage
	Under 17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	Above 25		
Under 31 in.	1	..	..	..	..	..	..	..	..	..	1	0·11
31—32 in.	..	..	..	..	..	..	..	..	..	..	..	..
32—33 ,, ...	..	11	3	..	..	..	..	..	..	..	14	1·52
33—34 ,, ...	1	56	84	7	1	..	1	..	..	..	150	16·34
34—35 ,, ...	..	39	124	40	15	5	3	..	..	3	229	24·86
35—36 ,, ...	..	23	106	63	28	21	6	6	3	2	258	28·20
36—37 ,, ...	..	9	27	36	30	12	9	5	2	3	133	14·48
37—38 ,, ...	..	1	16	21	10	7	9	2	6	4	76	8·28
Above 38 in.	..	1	3	11	13	10	6	5	3	5	57	6·21
Number of observations at each age	2	140	363	178	97	55	34	18	14	17	918	..

Mean maximum chest expansion (Lancashire) .. .. .. 35·37 inches
,, ,, ,, ,, (all recruits) .. .. .. 35·73 ,,
Standard deviation of maximum chest expansion (Lancashire).. 1·41 ,,
,, ,, ,, ,, ,, (all recruits).. 1·60 ,,
Co-efficient of correlation of maximum chest expansion (Lancashire) .. .. 0·547 ± 0·016
Correction in maximum chest expansion for each year of age (Lancashire) .. .. 0·449 inches

Conclusion.—The Lancashire recruits are less by 0·36 in. or $\frac{1}{4}$ of the standard deviation of the all-country recruits in maximum chest expansion. Of this 0·07 in. (0·16 × 0·449) is accountable to age, the difference being 0·29 in. as the characteristic defect. The variability differs less than in the other previous measurements.

TABLE V.—CORRELATION OF MINIMUM CHEST EXPANSION WITH AGE.
The frequency of minimum chest expansion is here shown at each age.

Minimum chest measurement	Age in years											
	Under 17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	Above 25	Total	Percentage at each age
Under 31 in.	1	35	22	1	..	..	..	..	..	..	59	7·43
31—32 ,, ...	1	54	106	12	6	3	1	..	..	..	183	19·94
32—33 ,, ...	..	34	127	61	19	11	4	1	1	5	263	29·76
33—34 ,, ...	..	11	63	53	35	20	8	9	3	2	174	19·96
34—35 ,, ...	..	6	34	32	19	6	14	3	4	5	123	12·42
35—36 ,, ...	..	..	9	13	16	9	5	1	5	1	59	7·43
36—37 ,, ...	..	..	2	5	1	4	2	2	1	..	17	1·96
37—38 ,, ...	..	..	..	1	1	..	..	..	..	2	4	·44
Above 38 ,, ...	..	..	..	..	..	2	..	2	..	2	6	·66
Number of observations at each age	2	140	363	178	97	55	34	18	14	17	918	..

Mean minimum chest expansion (Lancashire) .. .. .. 32·99 in.
,, ,, ,, ,, (all recruits) .. .. .. 33·41 ,,
Standard deviation of minimum chest expansion (Lancashire) .. 1·45 ,,
,, ,, ,, ,, ,, (all recruits) .. 1·33 ,,
Co-efficient of correlation of minimum chest expansion (Lancs.) .. 536 ± 0·016 in.
Correction in minimum chest expansion for each year of age (Lancs.) 0·452 in.

Conclusion.—The Lancashire sample of recruits is 0·42 in. in defect or $\frac{1}{3}$ the standard deviation of recruits in general, 0·07 of which (i.e., 0·16 × 0·452) being accounted for by age, leaving a difference of ·35 as the characteristic defect. The variability in this instance is rather greater in Lancashire recruits.

TABLE VI.—CORRELATION OF RANGE OF EXPANSION WITH AGE.

Range of expansion	Age in years										Total	Percentage
	Under 17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	Above 25		
Under 2½ in.	1	27	75	30	22	7	1	4	2	2	171	18·66
2½ ,, ...	1	59	138	62	30	17	16	7	4	4	338	36·73
3 ,, ...	..	44	112	64	27	24	14	3	5	6	299	32.47
Upwards of 3 in. ..	..	10	38	22	18	7	3	4	3	5	110	12·14
Number of observations at each age	2	140	363	178	97	55	34	18	14	17	918	..

Mean range of expansion (Lancashire) .. .. 2·93 inches
,, ,, ,, (all recruits) .. .. 2·73 ,,
Standard deviation of range of expansion (Lancashire) .. 0·49 ,,
,, ,, ,, ,, (all recruits) .. 0·59 ,,
Co-efficient of correlation of range with age (Lancashire) .. 0·093 ± 0·022
Correction in range for each year of age (Lancashire) .. 0·026 inches

Conclusion.—The same sample of Lancashire recruits has a greater range by 0·2 inches or $\frac{1}{3}$ of the variability of the all-country recruits. The difference of age would make the range 0·004 inches less (i.e., 16 × 0·026), so that the characteristic difference is slightly over 0·2 inches. The variability is again considerably less.

Summary.—In the sample of Lancashire recruits under analysis, in comparison with the all-country recruits, the *age* is less by $\frac{1}{10}$, the *height* less by $\frac{1}{2}$, the *weight* less by $\frac{1}{3}$, *max. chest* less by $\frac{1}{4}$, *min. chest* less by $\frac{1}{3}$ of the standard deviation, but the *range* of expansion is *greater* by $\frac{1}{3}$ of the standard deviation.

The variability from the mean is also less in the Lancashire recruit in each measurement except in that of the *min.* chest, in which it is rather greater.

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A CURIOUS CASE OF FEVER IN CALCUTTA.

By Captain F. H. BRADLEY and Major F. SMITH, D.S.O.
Royal Army Medical Corps.

The patient (aged 22; service four years; service in India two years) was an inmate of the Station Hospital, Calcutta, and was the subject of much discussion. The disease was contracted at Jaffarpur Musketry Camp, near Barrackpur, a few miles from Calcutta. The man was admitted to hospital on the day of his return from the camp to Calcutta. He was then obviously very ill. The conjunctivæ were injected and his face was dusky. A few days after admission a rash appeared; this covered the face, extremities and body, it was of the nature of a subcuticular mottling, which at first glance suggested measles. The rash persisted, small pinkish spots also appeared on the chest and abdomen. The bowels were constipated. The man became notably dull and apathetic with a congested look about the face. Clearly this was no ordinary case; a "dangerously ill" report was sent in. Clinicians who judged by the patient's odour said it must be enteric, but a blood-culture did not afford any aid in forming a diagnosis. A note appears in the case sheet, "eyes have a heavy appearance and are red and watery." The condition became graver, urine was passed in bed, the catheter had to be used frequently, delirium set in. Then there was a sudden fall of temperature, followed by collapse necessitating intravenous

injections of saline fluid, under which the man rallied, while there was no return of the fever. Meantime, bedsores had developed in spite of the usual precautions, and his condition was still precarious with restlessness, muttering delirium and subsultus tendinum. Under a full dose of opium he got some sleep that night—he was distinctly better next morning. Two days later he answered questions when roused, but was lethargic. The bedsores and his general condition improved, but a catheter still had to be used. The following day the bladder acted, but the patient was still only partially sensible, and thought the orderlies wanted to poison him. Six days after the fall of temperature the patient was considered to be out of danger.

The important points in the case are: the injected, flushed appearance of his eyes and face, the eruption, the marked delirium, the nervous prostration and general severity of the case as contrasted with the mild and short fever. Blood-films were examined but gave no indication of malaria.

Diagnosis.—In consultation one of us suggested typhus. No one else had seen the disease, but on reading up the subject the whole hospital staff was struck with the general correspondence of this case with text-book descriptions. Nevertheless, counsels of wisdom prevailed, and the disorder was returned as "Pyrexia of uncertain origin." Typhus fever is a forgotten disease as far as the Army is concerned, and it is difficult to find anyone who knows much about it. Diagnosis of a case would raise a storm of hostile criticism. We might be told that a correct diagnosis was "measles."

REMARKS.

Charteris, who knew typhus in Glasgow, says, in his "Practice of Medicine": "in an epidemic form the diagnosis is easy, but isolated cases may be very difficult to distinguish from typhoid fever." Absence of epidemicity is not of much account, the disease would not be likely to spread in a community living under sanitary conditions such as the British Army in India, and as a matter of fact, when typhus appeared a few years ago in London, it did not spread, neither does it nowadays to any great extent as far as we know in the epidemic centres—Glasgow, Dundee and Dublin. Withal there is difficulty in accounting for an isolated case in Calcutta, where the disease seems to be unknown.

Typhus occurs in the Punjab—see Jail Report, 1886, and Report of Sanitary Commissioners with the Government of India, 1888; also Annual Report of Sanitary Officer, 1st Division, for 1907, concerning an outbreak among Indian troops and followers at Peshawar; also *Indian Medical Gazette* for June, 1908. Some followers of the Gurkhas in Abbotabad were believed to have died of typhus in 1908. It is possible, therefore, that in some obscure way infection may have reached this man from the Pathans who come to Calcutta in large numbers in the autumn.

It is likely that an odd case of the disease among British troops would not be recognized. Few people having seen the disease, and it having been looked upon as more or less extinct, the idea of typhus would not always occur to the puzzled diagnostician.

After all, we have perhaps in this case an example of a new disease—unknown to medicine.

Abstract.

THE RUSSIAN MANUAL OF PHYSICAL TRAINING.

Précis by Major G. S. McLOUGHLIN, D.S.O.
Royal Army Medical Corps.

The existing instructions for the gymnastic training of troops (*Nastavleniye dlya obucheniya voisk gimnastikye*) are contained in the form of a manual published in 1910.

It is laid down in the general instructions that the aim of this training is to develop the physical strength of the soldier in all respects, to prepare him for military training, to train him to sustain the fatigues of fighting and marching, and to skilfully overcome obstacles met in war.

The training is to be carried out daily during the winter period for the whole term of service in all branches; in the summer period, when the troops have plenty of other physical work to do, the daily physical training is carried out when possible.

The duration of the daily lesson should be from half an hour to an hour.

The direction of physical training is the duty of company, squadron, or battery commanders. Junior officers are appointed to train parties and detachments, and should be well able to instruct. Non-commissioned officers, who work as instructors under the direction of officers, should be prepared and able to take the place of the latter on occasion.

The training should take place at suitable times, in order to avoid distress, not immediately after hard exercise or work of other kinds, or when the men are hungry, or less than two hours[1] after a meal.

For gymnastic work either blouses or coats are worn, with waistbelts loosely buckled. Cravats and caps may be discarded. Apparently the men work in the ordinary breeches and long boots.

Ventilation and freedom from dust are matters to which attention is to be paid; the work is to be as much as possible in the open air.

[1] One hour is the period mentioned in our Manual.

Stress is laid on the value of music in physical training. Ten pages of the manual are occupied with suitable music, vocal and instrumental.

As regards medical supervision, it is mentioned that on the recruits joining their units a medical inspection is held, at which company, squadron, or battery commanders, with their junior officers, are present. The medical officer then issues his instructions regarding any men to be kept under special observation. A medical inspection is also made every year with the object of ascertaining the extent of progress in physical fitness. The results of this inspection are entered in the book in which the results of all medical inspections are recorded.

The manual contains a section dealing with elementary anatomy and physiology on much the same lines as the corresponding section in our own manual. The figures illustrating the letterpress are apparently copied from those in our book.

The illustrations showing the manner in which various exercises should be performed are reproductions of photographs.

The gymnastic course consists of :—

(1) Free exercises and exercises with rifles or rods.

(2) Exercises with apparatus.

(3) Walking and running exercises.

(4) Field gymnastics.

(5) Group displays, sports and games, throwing spears and weights, &c.

The free exercises are either "simple" or "complex." The former are of much the same general nature as those laid down in our manual, though they differ from these in detail, and in some cases as regards obvious special intention. The "complex" exercises (which are practically combinations of simple exercises) are for later training, and are not taught until the soldier has fully mastered the simple exercises, as will be seen hereafter when the exercises contained in the successive tables are mentioned. The complex exercises are contrived specially for the cultivation of muscular control and co-ordination.

The exercises with rifles or rods are largely similar to, though more varied than, the old physical drill with arms which is now in disfavour with our authorities.

The apparatus of the gymnasium described in the manual consists of the spring-board, jumping standard, beam, inclined ladder, parallel bars, pommel horse, horizontal bar, mats, mattresses, leaping poles and rods. It is obvious that, in addition, poles and ropes for climbing are in use.

The spring-board is about 28 in. square: the raised edge is not more than $3\frac{1}{2}$ in. in height from the ground.

The jumping standard consists of two uprights with cross footpieces (peg-holes $1\frac{3}{4}$ in. apart) and a thin cord weighted at each end, with a central flag attached.

The beam rests either on two adjustable standards or on the wall and one trestle support: its length is not less than 9 ft. 4 in.

The ladder is inclined at an angle of about 25° from the vertical: the distance between rungs is $7\frac{7}{8}$ in., and the breadth of the ladder $24\frac{1}{2}$ in.

The parallel bars are adjustable as regards height. Much work is done on these.

The horse (on four legs) has two iron loop handles (pommel and cantle); these are removable so that the apparatus serves either as a pommel horse or plain horse. The wooden body is bound round with bass or seaweed and covered with leather or canvas. The handles are bound with yarn and leather. The length of the body is from $73\frac{1}{2}$ to $80\frac{1}{2}$ in., the variation being in what is termed the neck; the width diminishes from "croup" to "neck." The length of the legs may be adjusted.

The horizontal bar is of steel (which may be covered with veneer) of $1\frac{1}{2}$ in. diameter. The height is adjustable.

The leaping-pole is of strong wood, about 10 ft. 6 in. in length; the thickness is $1\frac{3}{4}$ in. at the lower end, nearly $\frac{1}{2}$ in. less at the upper end. The lower end is shod with iron and has a short spike.

The rod (for use instead of a rifle) is usually of iron, 42 in. in length and weighs from 4·5 to 6·3 lb. A wooden rod, weighted at the ends with lead, may be used.

Walking exercises are carried out either at the ordinary infantry quick step or at the "accelerated" pace (150 paces per minute). Running exercises are carried out at the double or at an accelerated pace.

The length of the running pace is from 35 in. to 42 in., according to stature and load carried; the number of paces per minute is from 160 to 175.

Example of Time-table for Walking and Running.

Week		Walk	Number of minutes					Walk
			Run	Walk	Run	Walk	Run	
1st	Without equipment	Two minutes' free walking to rouse breathing	1	3	1	3	1	Three minutes' free walking while breathing returns to normal
2nd			1	3	1	3	1	
3rd			2	3	1	3	1	
4th			2	3	2	3	1	
5th			2	3	2	3	2	
6th			3	3	2	3	2	
7th			3	3	3	3	2	
8th			3	3	3	3	3	
9th			4	3	3	3	3	
10th			4	3	4	3	3	
11th			4	3	4	3	4	
12th			4	3	4	3	4	
13th	With equipment		1	3	1	3	1	
14th			2	3	1	3	1	
15th			2	3	2	3	1	
16th			2	3	2	3	1	

Men are trained to run individually at first, and later in squads; they begin their training without equipment or arms and wear the fatigue blouse: they are later trained to run under the full load of a soldier, first in complete uniform, then with rifles but without ammunition, then also carrying ammunition, and finally in full marching order.

At the ordinary double, rifles are carried at the slope, slung, or at the trail; at the accelerated running pace, at the trail or slope. Only the infantry undergo full gymnastic training in the art of getting over ground.

To commence with, men do not run for more than a minute, the periods of running being gradually lengthened by half minutes up to four minutes. Then they run in uniform without arms and on level ground, and later with arms, on uneven as well as on level ground. Then, when the men can do the four minutes' run with arms without any distress, the further training in running in marching order commences, first for one minute at a time, gradually increasing the period up to two minutes.

For the "accelerated" running exercises no normal standard is laid down; the individual is taught simply to develop his natural powers in this respect. It is recommended that men should (as part of their regulated training) run races against each other for distances up to 200 paces, beginning their training in this respect with sprints of not more than 50 paces, then running 100 to 150 and finally 200 paces. For accelerated running in marching order from 100 to 150 paces is a sufficient distance. Not more than ten men run in each race; they start at 2 paces interval. Exercises are practised "to re-establish breathing and circulation." In these exercises the men are taught to take slow, deep inspirations, the ribs being well raised without drawing in the stomach; inspiration is through the nose, expiration through the mouth. These breathing exercises, though described in the section (of the manual) dealing with training in running, are also practised in the middle and at the end of each lesson in gymnastics, also after any specially hard work.

There are three breathing exercises, one of which is to be practised during the lesson in running; in each exercise the arms are raised with a deep inspiration and lowered with expiration.

During marching (especially at the double) and at all physical exercise, men are taught to breathe through the nose deeply and at a not too frequent rate.

The general gymnastic course is arranged in twelve tables, of which the first six are for young soldiers, the next four for men of more service, and the last two for good gymnasts, for competitions, and as a model for formulating complicated exercises.

Instruction in Table I. is imparted to the young soldier for his first month; succeeding tables represent instruction in successive fortnights, so that the young soldier has been instructed in the first six tables by the time he is posted to the ranks for general duty after four months' preliminary training. With two months' preliminary training before

posting the young soldier should have gone through the first three tables.

Infantry, cavalry and artillery go through all twelve tables, comprising all exercises specially laid down for each arm.

Engineers and non-combatants need only do the first six tables, repeating these throughout their service.

Certain exercises with apparatus specially mentioned in the tables are not obligatory for all branches.

Combatant soldiers of infantry, cavalry and artillery units go through Tables VII to X in the second winter of their training (in the cavalry, soldiers of the "junior term of service" go through Tables VII and VIII before the autumn inspection).

In subsequent years of service the exercises of the previous year are repeated.

Table I.—Simple free exercises (Nos. 1 to 27) for neck, arms, trunk and legs. Parallel bars, pommel horse.

Table II.—Simple free exercises (Nos. 28 to 40). Parallel bars, pommel horse. High jump (standing jump from both feet, pace and jump).

Table III.—Simple free exercises (Nos. 41 to 50). Parallel bars, pommel horse, horizontal bar. High jump (with a run, off either foot and both feet).

Table IV.—Complex free exercises (Nos. 51 to 61). Parallel bars, pommel horse, horizontal bar. Long jump.

Table V.—Complex free exercises (Nos. 52 to 66) Rifle exercises. Parallel bars, horizontal bars, plain horse (infantry and engineers do not work with the last). High jumps with run (42 in.), long jump with run (70 in.), downward jump (56 in.).

Table VI.—Rifle exercises. Parallel bars; beam (not for cavalry); pole, rope and ladder climbing. High jump (45·5 in.), long jump (up to 9 ft. 4 in.) downward jump (7 ft. from sitting position, 4 ft. 10 in. from standing position).

Table VII.—Complex free exercises (Nos. 87 to 93). Rifle exercises. Parallel bars; pommel horse; plain horse (not for infantry); horizontal bar. High pole jump (4 ft.).

Table VIII.—Complex free exercises (Nos. 105 to 108). Rifle exercises. Parallel bars; pommel horse; plain horse (not for infantry); horizontal bar. Long pole jump.

Table IX.—Complex free exercises (Nos. 116 to 120). Rifle exercises. Parallel bars; pommel horse; plain horse (not for infantry); horizontal bar.

Table X.—Complex free exercises (Nos. 126 to 130). Rifle exercises. Parallel bars; pommel horse; plain horse (not for infantry); horizontal bar.

Table XI.—Complex free exercises (Nos. 136 to 139). Rifle exercises. Parallel bars, pommel horse, horizontal bar.

Table XII.—Complex free exercises (Nos. 149 to 152). Rifle exercises. Parallel bars, pommel horse, horizontal bar.

All exercises in Tables XI and XII are of a competitive nature.

The course of "field gymnastics" (obligatory only for infantry) presents several features of interest and may therefore be considered at length.

The section of the manual dealing with this subject is illustrated with diagrams showing plans and sections of obstacles. It contains full instructions as to how to construct the obstacles.

I.—General Instructions.

The aim of field gymnastics is to teach the soldier to overcome natural and artificial obstacles. These may be overcome in one of two ways, either by leaping or scrambling.

Leaping includes long jumping, high jumping, and downward jumping.

Scrambling includes getting up and down slopes, crawling and the surmounting of perpendicular obstacles (fences, walls) by using the hands and feet.

The special apparatus of field gymnastics includes :—

(1) Ditches and trenches.

(2) Fences (wooden).

(3) Declivities and ascents (artificial mounds or banks and fortifications).

(4) Earth and stone walls.

In addition, it is useful to learn to negotiate such obstacles as troops may on occasion encounter on the march, such as :—

(1) Mountain streams (by jumping from rock to rock).

(2) Marshy ground (by making use of small hillocks).

(3) Barriers (posts and rails).

(4) Breaks in bridges, or ditches, across which a beam has been thrown, &c.

For instruction in field gymnastics, in a place where the ground is cut up (where there are ditches, fences, hillocks and ravines) there may be no necessity to construct special artificial obstacles, but local conditions may necessitate the construction of all obstacles, or the natural obstacles existing in any place convenient for construction may be supplemented by artificial obstacles; or the necessary omission of certain obstacles may be compensated for by suitable instruction.

Artificial obstacles are made of a breadth not greater than $23\frac{1}{3}$ ft. This allows three men to take the obstacle at the same time. To send over at the same time a greater number militates against proper instruction being given to individuals (during preliminary instruction) at the various obstacles.

Distances between obstacles in the course more or less conform to

suitable lengths of preparatory run, varying between 7 ft. and 84 ft.; the total length of the course is from 350 to 400 paces.

The men, who have been previously trained in marching and running, are taught to gradually acquire proficiency in getting over the obstacle course. At first the course is taken at a walk or the slowest running pace which is suitable. In later training the course is run at speed, first by three men at a time, then by groups of a squad or more. Finally the men run the course at speed in marching order.

In group work the men are taught to avoid hindering each other, and on the contrary, to help each other as much as possible, without individual "showing off" or superfluous activity.

Twelve types of artificial obstacles are laid down by regulation. As a model arrangement, the obstacles are disposed in a course, from 350 to 400 paces in length, at such distances one from another that the men under instruction may be able to determine beforehand how best to take each succeeding obstacle according to their individual powers, and to develop or modify speed accordingly, with due regard to the conditions laid down as to the manner in which an obstacle is to be taken.

II.—Construction of Artificial Obstacles.

No. 1.—Ditches.

(*a*) *Ditch for Long Jump.*—This is of three widths; its depth is at the straight take-off side 2 ft. 4 in., and gradually diminishes to the landing side, where the slope of the cutting gradually merges with the ground level, and where at distances, from the take-off of about 8 ft. 2 in., 9 ft. 9 in., and 11 ft. 8 in. respectively, sand beds are laid down extending into the level ground. This obstacle is contrived for jumps of from 8 ft. 2 in. to 16 ft. 4 in. (to the farther limit of the sand at the broadest part of the ditch). Obstacles No. 1a and No. 3a, are intended to represent the elements of field fortification.

(*b*) *Zigzags.*—This obstacle consists of three parallel zigzag trenches, representing communication ways. The turf removed is stowed, with earth, on both sides of each trench, forming low embankments rather less than 9 in. high (as measured from the ground level). The width of a trench is about 47 in., and the interval between trenches 38½ in. The length of the trenches measured in a straight line is 38½ ft. There are two angular bends (to left and right) in each trench, so that the changes of direction in passing along the trench are, roughly, quarter left, quarter right, quarter left.

Men run along these trenches, crouching so that they cannot be seen from a flank.

(*c*) *For Crawling.*—This obstacle consists of three straight parallel trenches: depth about 30 in., length about 32¾ ft., width about 47 in., interval between trenches 38½ in. Boards, on sleepers, are laid at the bottom of a ditch to prevent soiling of clothing.

No. 2.—Wooden Fence (wall).

This obstacle is constructed of upright beams and of planks laid edgewise one above another horizontally. The uprights are so arranged that the fence is divided into three sections, about 9 ft. 9 in., 8 ft. 2 in., and 7 ft. 5 in. high respectively. The uppermost planks may be taken off to lower the height of the obstacle during instruction.

The fence is surmounted with a jump and grasp of the hands, or climbed with the aid of one or two men.

No. 3.—Banks.

(*a*) "*Glacis.*"—The height of this bank is about 5 ft. A steep face meets a face of easy slope forming an embankment about 12 ft. thick (as measured on the ground level), less than one-twelfth of the base lies under the steep face. Men jump or climb up the steep face and run or scramble down the other.

The bank is made of turf laid horizontally, except where the easy slope and flanks are faced. The steep face may be revetted with wattling, &c.

(*b*) *Bank for Running Up (or Crawling Up) and Jumping Down.*—This bank may be regarded as the "glacis" reversed. It is built in three contiguous sections, respectively about 8½ ft., 7 ft., and 5 ft. high. The thickness at base is the same in all sections, about 19½ ft.

Men run or crawl up the easy slope and jump down the steep face. In order to diminish jar on landing a small ditch is cut and filled in first with brushwood (or pine, or other twigs), then with a layer of turf and finally with sawdust.

No. 4.—Earth Rampart.

This is in reality a wall built of turf in three contiguous sections, respectively about 3½ ft., 3 ft. and 2½ ft. high, with a small ditch, nearly 20 in. in depth and width, on the far side. It is cleared with a running jump. The thickness of the wall is about 2½ ft. at base and 2 ft. at top.

No. 5.—"Stones."

This obstacle represents stepping stones or rocks in a stream. Square (19½ in. × 19½ in.) pieces of plank, 1½ in. thick, fastened on sleepers, are commonly used in lieu of stones. To obviate slipping the upper surface of the square board may be covered with pitched roofing material, or coated with pitchy or resinous composition, and be grooved crosswise. The "stones" may be made of cemented brickwork.

In each of three series (nearly 33 ft. long) are seven of these "stones"; their arrangement and the distances between them may be varied, provided that the stones of a series are not arranged in a straight line or at

equal distances. This obstacle serves to train men to vary the direction of movement at a rapid pace and to apply variety of method in jumping, using double leaps twice in succession off the same foot, or (ordinarily) passing along taking off from the left and right foot alternately.

In the explanatory figure (plan) the changes of direction in one series are shown as being, in succession, half-left, straight on, half-right, half-left, straight on, half-right.

No 6.—"Marsh Hillocks."

These are made of large sods of turf and are rectangular mounds about 23 in. high, 19 in. broad and 16 in. high. To avoid injury to the feet, only the lowest stratum of turf is staked down. The obstacle consists of three series of hillocks in parallel straight lines; in each series are three hillocks; the top of the first is sloped backwards. The hillocks of a series are 6 ft. 5 in. apart, and at the same distance beyond the last is a sand bed also 6 ft. 5 in. across. The men leap from hillock to hillock and into the sand, going "free."

No. 7.—Bar or Barrier.

This is an obstacle of the nature of posts and rails, simply "posts and rail" in two-thirds of its breadth, but having a second and higher rail in the remaining portion. The long or lower rail runs the whole breadth, 49 in. above the ground; the short or upper rail extending over one-third of the length of the lower rail is 7 ft. 10½ in. above the ground. There are two long and two short uprights or posts.

This obstacle is surmounted by vaulting or by grasping the top bar with one hand or both hands and leaping through between the upper and lower bar.

No. 8.—Horizontal Planks.

This obstacle is for practice in balancing, and consists of three parallel horizontal planks. Each is a kind of bridge formed of a plank about 3½ in. thick (and apparently from 7 to 9 in. wide), laid flat on and fastened at the edges to five uprights. The length of the plank is a little over 29 ft., it is 2½ ft. above the ground. As an aid to mounting the plank, a step of turf about 16 in. high is placed at the near end of the plank.

Men pass along these bridges going "free" with knees bent.

No. 9.—Field Fortifications.

A fortification is constructed according to existing instructions, and the rushing of this with a cheer constitutes the finish of the obstacle course.

MODEL FOR ARRANGEMENT OF OBSTACLES IN A COURSE.

Wooden fence (No. 2).
"Stones" (No. 5).
"Zigzags" (No. 1*b*).
Earth wall (No. 4).
Horizontal planks (No. 8).
Ditch (for long jump) (No. 1*a*).
"Glacis" (No. 3*a*).
Trenches (for crawling) (No. 1*c*).
Bank for running (or crawling) up and jumping down (No. 3*b*).
"Marsh hillocks" (No. 6).
"Barrier" (No. 7).
Field fortification (No. 9).

Distance between Nos.	2	and	5	...	...	49 ft.
,, ,, ,,	5	,,	1*b*	...	...	7 ,,
,, ,, ,,	1*b*	,,	4	...	...	47 ,,
,, ,, ,,	4	,,	8	...	...	33 ,,
,, ,, ,,	8	,,	1*a*	...	...	49 ,,
,, ,, ,,	1*a*	,,	3*a*	...	...	51 ,,
,, ,, ,,	3*a*	,,	1*c*	...	...	26 ,,
,, ,, ,,	1*c*	,,	3*b*	...	...	33 ,,
,, ,, ,,	3*b*	,,	6	...	...	33 ,,
,, ,, ,,	6	,,	7	...	...	49 ,,
,, ,, ,,	7	,,	9	...	...	84 ,,

The display performances consist of "groups" without apparatus (there are two kinds of groups), and of "pyramids" with parallel bars and with vaulting horse.

A list of games and sports recommended is given. Among the former is included football, among the latter are walking on stilts and snowshoes, racing on the flat and over obstacles, three-legged and hobble races. The method of conducting the tug-of-war is described, as is also a game, in which the sides compete in a kind of relay race, and the sports of spear throwing, putting and throwing the shot and throwing the hammer.

The spear is about 11 ft. 8 in. long and weighs from 2·8 lb. to 4·5 lb.; the shaft is of cane (or light wood), the thick end bearing a pointed head of metal.

The ordinary shot weighs from 9 lb. to 13·5 lb. It is put with a run up of three paces; a put of from 21 ft. to 24½ ft. is expected. For practice in hand grenade throwing from a stand and height (as out of fortifications, buildings, &c.), a shot weighing from 4½ lb. to 9 lb. is used; this is thrown without a run by either a shoulder or a back throw.

The hammer shaft is about 21 in. long, the hammer head weighs from 1·8 lb. to 2·7 lb. The hammer is thrown with a one-hand grasp, with a shoulder or a back throw, and with or without a run. Satisfactory throws are 105 ft. with a run, or 35 ft. from a lying position. Throwing the hammer is intended as practice for work with hand grenades, and stress is laid on the necessity for throwing correctly, so that the hammer falls with the handle vertical, because it is only by this kind of throw that the charge of the grenade is exploded.

A general perusal of this book inclines one to the opinion that the Russian system of physical training is very thorough, moreover that, though every precaution is ordered to be taken to bring the men on gradually, it is on the whole more severe than our own, especially in the exercises with apparatus. One would suppose that the Russian authorities were not as convinced as our own as to the efficiency of free exercises. What is specially admirable in the Russian system is the variety of the free exercises as tending to diminish boredom in the men under instruction, and the large number of "practical" exercises which link physical training with more special forms of military training. A system of physical training in which these points are emphasized is, however, likely to prove complicated in practice.

But in comparing the Russian system with our own we should remember that the Russian authorities are not legislating for the immature lad, that the regiments practically receive all their recruits on a settled date in each year (there is nothing in Russia corresponding to our depots) and that the large majority of these recruits are of a hardy "backwoods" type. Under these conditions it should be possible to train hard and get good results.

Lectures.

THE SANITARY ORGANIZATION OF THE IMPERIAL AND INDIAN ARMIES, WITH SANITARY LESSONS FROM AN ORIENTAL CAMPAIGN.[1]

By Major R. J. Blackham.

Royal Army Medical Corps.

"It is disease, not the field of action, which digs the graves of armies."—*McCulloch's Malaria, dated* 1827.

Frederick the Great once said that "God fought on the side of the strongest battalions," and it has also been asserted that "it is disease and not the field of action which digs the graves of armies." The keeping of his battalions as strong as possible must ever be an all-important question for the Commander in the field, and, as it can be shown by military history, it is microbes more than bullets that the soldier has to dread. The study of the means of preventing disease in war—i.e., sanitary organization is, therefore, a matter of more than passing interest to every one interested in the welfare of armies.

[1] A lecture delivered to the officers and non-commissioned officers of the First Division of the Indian Army. (Received for publication on May 30, 1911.—Ed.)

I promise not to weary you with figures, but I venture to emphasize this essential point by quoting just five instances, three in the experience of our own Army, one instance from the French Army, and one from the American Army, all of which occurred in the past century.

British Army.—(1) The Walcheren Expedition of 1809, in which there were 23,000 deaths in four months out of a force of 39,000 men. On this occasion 217 men were killed by the enemy.

(2) The Ashanti Expedition of 1864, which simply melted away from disease. Those who did not die were invalided.

(3) The Tirah Campaign of 1897, in which there were twenty-five admissions per thousand for disease for each one from wounds, and fourteen deaths due to microbes for each one credited to the Afridis.

French Army.—In the French Expedition to Madagascar in 1895, a third of an army of 23,000 men died from malaria alone.

American Army.—In 1898, after the capture of Santiago, one-half of the American Army in Cuba was incapacitated at the same time from disease. The condition of affairs was so grave that it evoked an appeal to the War Department, signed by all the officers of higher rank, for an immediate removal of the troops to a healthier locality, using the sentence "this army must be moved or perish."

Scattered instances of this kind might be multiplied indefinitely, but in studying war from history the maximum instruction is to be obtained, according to the Training and Manœuvres Regulations, 1909, Section 5, by a close examination of operations from a selected campaign, rather than from a broad view of the leading incidents of many wars.

Applying this principle to military sanitation, I propose to briefly sketch to you the sanitary organization for war of our own Army, both in Europe and in India, and then to point out the methods which were adopted in the Russo-Japanese War, a campaign which is worthy of special study by soldiers serving in the East, as it is the first instance of an Oriental power defeating a European army by Western methods.

The organization of the sanitary service of an army in the field is laid down in the Field Service Regulations for the Imperial Army, and in a recent Indian Army order for the Indian Army.

These Regulations lay down as a fundamental principle that the study of sanitation and the preservation of health is incumbent on every officer and soldier. It is declared that the importance of sanitary measures, whereby health is preserved, cannot be over-estimated.

The commander of every unit and formation is responsible for the sanitary condition of the quarters and localities occupied by his command; and for taking all measures necessary for the preservation of the health of those under him. He is also responsible for seeing that each officer and soldier observes all sanitary orders, and also for the good order and cleanliness of that portion of a quarter or locality under his charge, irrespective of the period for which the latter may be occupied.

These regulations effectively break down the old notion that sanitation is a matter for the doctors, and show that the authorities fully realize that the rôle of the medical officer is essentially advisory, and that it is the soldier and his officer who are the executive sanitarians of military life.

It is the duty of the cleric to preach the Gospel, but the salvation of the individual must depend on his own exertions. Similarly the military surgeon can but preach the gospel of hygiene and rely on his executive brother officers for its practical application.

The personnel which will be concerned in the preservation of health of future armies is threefold :—

(I) The Regimental Sanitary Organization of Field Units.

(II) The Sanitary Organization on the Lines of Communication.

(III) The Sanitary Inspection Committee.

Let us consider these *seriatim.*

(I) *The Regimental Sanitary Organization of Units in the Field.*—The sanitary service of field units is organized on the principle that every unit, through its commander, is responsible for its own sanitation and for the sanitary condition of any area it may occupy. For this purpose each unit is provided with a regimental sanitary detachment, drawn partly from the ranks of the Royal Army Medical Corps and partly from the ranks of the unit itself in the case of the Imperial Army, but entirely from the latter source in the case of the Indian Army.

The establishments of the regimental detachments of the Royal Army Medical Corps is as follows :—

For each	Cavalry Regiment	1	N.C.O.	and	2 men.
,,	Infantry Battalion	1	,,	,,	4 ,,
,,	Field Artillery Brigade	1	,,	,,	3 ,,
,,	Horse Artillery ,, ...	1	,,	,,	2 ,,
,,	Howitzer ,, ...	1	,,	,,	2 ,,
,,	Mounted Infantry Battalion	1	,,	,,	2 ,,
,,	Field Company Royal Engineers				2 ,,
,,	Divisional Ammunition Column	1	,,	,,	3 ,,

The Sanitary personnel furnished from the fighting men of the unit itself is :—

Cavalry Regiment	1	N.C.O.	and	8 men.
Infantry Battalion	1	,,	,,	8 ,,
Horse Artillery Brigade..	1	,,	,,	6 ,,
Field Company Royal Engineers and similar units..				2 ,,

The medical officer of each unit is responsible to its commander for the efficient performance of the work of the regimental sanitary detachment. The commander is, in his turn, required, by para. 71 Field Service Regulations, Part 2, to see that all ranks render loyal and intelligent assistance to the medical officer in the performance of his duties, and that

the efficiency of the unit is not impaired through neglect or non-compliance with sanitary rules.

From this it is apparent that the medical officer of a unit is *primarily* a regimental officer of health, and *secondarily* an executive military surgeon, rendering medical and surgical aid in all the exigencies of war.

The regimental sanitary personnel of a unit should be formed from men specially trained, as they have to act generally as sanitary police, in order to prevent soil pollution, and *in detail* to supervise :—

(1) The preparation and care of latrines and urinals, including, of course, the proper filling in and marking of old sites.

(2) The systematic collection, removal and disposal of refuse by burning or otherwise.

(3) The construction of ablution places and the disposal of waste water.

(4) The sanitation of cooking places, horse and mule lines, and slaughtering places in the area occupied by the unit.

The duties of the Royal Army Medical Corps, rank and file, attached to a unit are detailed as follows in the Regulations :—

(1) The daily supervision of the water supply, and its purification for drinking purposes by boiling, filtration, or the addition of chemicals as may be directed.

(2) The charge of all apparatus and stores connected with the water supply of the unit.

(3) The supervision of the use of disinfectants in camp or quarters as may be necessary.

(4) The care of the sick of the unit until they are removed to hospital, the immediate removal and segregation of all cases of infectious diseases, and, if necessary, of "contacts."

In India we have no special Corps, such as the Royal Army Medical Corps, and therefore the duties performed by the Regimental Sanitary Detachments and the Royal Army Medical Corps, for water duties with Imperial troops are, as we have seen, performed in the Indian Army by Regimental Sanitary Detachments which are organized for peace duties in accordance with Indian Army Order, No. 354 of 1907. For war their personnel remains as in peace time, viz. :—

Regiment of Cavalry	1	N.C.O.	and	1	man	per	squadron.
Battalion of Infantry	1	,,	,,	1	,,	,,	company.
Other units	1	,,	,,	1	,,	,,	unit.

Each detachment is under the orders of the medical officer in charge of the unit or of the medical subordinate in units without a medical officer. Its duties in war will be :—

(1) Supervision of water supplies, including the protection, purification, and distribution. Apparatus and chemicals required for these purposes will be in charge of each detachment.

(2) Supervision of food supplies, cooking, and slaughter places of their units, and disposal of waste water and refuse.

(3) Disinfection.

(4) Supervision of the ablution places of their units and disposal of waste water.

(5) Conservancy, refuse disposal, and cleanliness of their camps, including that of animals' lines.

(6) Acting as sanitary police.

Indian Army Order No. 780, of 1910, lays down that during an action the regimental sanitary detachment will assist the stretcher-bearers of the unit in the removal of the wounded and dead. This is special to India.

The work of supervising the regimental sanitary arrangements in the field will fall to the following special sanitary officers :—

(1) The Assistant Director (Sanitary) attached to the Headquarters of the Army.

(2) The Principal Medical Officer, assisted by the Medical and Sanitary Officer with the Headquarters of the Cavalry Division.

(3) The Principal Medical Officer, assisted by the Medical and Sanitary Officer with the Headquarters of the Infantry Division.

(II) *The Sanitary Service on the Lines of Communication.* — The sanitary service on the lines of communication is organized on a more elaborate basis than that for field units. It comprises :—

(1) Special sanitary officers. (2) Sanitary sections. (3) Sanitary squads (with the Imperial Army only).

(*a*) The sanitary officers are, invariably, officers of the Royal Army Medical Corps, who have specialized in sanitation, with, perhaps, the single exception of the sanitary officer of the Base.

(*b*) Sanitary sections have no permanent organization in peace.

With an Imperial Force the sanitary sections consist of one officer of the Royal Army Medical Corps and twenty-six rank and file of the Corps trained in sanitation.

With an army organized in India the personnel and organization of a sanitary section is as follows :—

	N.C.O.'s	Privates	Native establishment		
			Sweepers	Bildars	Bhisties
British	2	8	0	0	0
Indian	2	12	60	10	5
Total	4	20	60	10	5

Each section is divisible into squads as may be required. It will be commanded by a medical officer, but in certain circumstances, such as employment at the base of operations, two or more sections may be commanded by one medical officer.

Divisions and Independent Brigades furnish sanitary sections as follows :—

Northern Army :—

1st (Peshawar) Division..	3 Sections.	Numbered	1 to 3
2nd (Rawalpindi) ,, ...	4 ,,	,,	4 ,, 7
3rd (Lahore) ,, ...	4 ,,	,,	8 ,, 11
7th (Meerut) ,, ...	5 ,,	,,	12 ,, 16
8th (Lucknow) ,, ...	5 ,,	,,	17 ,, 21
Kohat Brigade	1 Section.	Numbered	22
Bannu ,, ...	1 ,,	,,	23
Derajat ,, ...	1 ,,	,,	24

Southern Army :—

4th (Quetta) Division	3 Sections.	Numbered	25 ,, 27
5th (Mhow) ,, ...	4 ,,	,,	28 ,, 31
6th (Poona) ,, ...	5 ,,	,,	32 ,, 36
9th (Secunderabad) ,, ...	5 ,,	,,	37 ,, 41
Burma	3 ,,	,,	42 ,, 44
Aden Brigade	1 ,,	,,	45

The personnel of the sections will be taken from the non-commissioned officers and men of infantry units who have been trained in sanitation, in accordance with Army Regulations, India, vol. xi., paragraph 893, as amended by January Appendix 2, Indian Army Orders of 1910. Under the orders of general officers commanding divisions, all units will be informed of the number of non-commissioned officers and men they will be required to furnish on mobilization, and the section to which they will be posted. The sections to be formed in the three independent frontier brigades will be composed of Indian troops only. Commanding officers are responsible that the requisite number of trained men is always forthcoming. Any further practical training of the sections which may be necessary will be arranged by the general officers commanding divisions. Indian Army Orders lay down that the personnel of sanitary sections should be brought together and exercised during manœuvres, and a medical officer or officers appointed to command them.

(3) Sanitary squads consist of one non-commissioned officer and five men of the sanitary section of the Royal Army Medical Corps.

The sanitary squad is only organized for Home troops. It has no equivalent in an Indian Army.

For the purpose of sanitary administration the lines of communication are divided into :—

(1) Sanitary districts. (2) The base. (3) Sanitary posts.

As a rule, the base, railhead, and any specially important parts will constitute separate sanitary districts.

(1) *The Sanitary District.* — A specialist sanitary officer will be appointed to each district, and a sanitary section will be allotted thereto, which may be augmented from time to time, and supplemented by civilian labour as required.

(2) *The Base.*—The base will, of course, form the most important of these districts, and will be in charge of a special sanitary officer, who

DISTRIBUTION OF SANITARY SERVICE IN THEATRE OF WAR.

Cavalry Division

Sanitary Officer with H.Q. Division.

Regimental Sanitary Squads and R.A.M.C., attached 3 per Regiment for Water Duties.

INFANTRY DIVISIONS.

Sanitary Officer with H.Q. Divisions.

Regimental Sanitary Squads and R.A.M.C., attached 5 per Battalion.

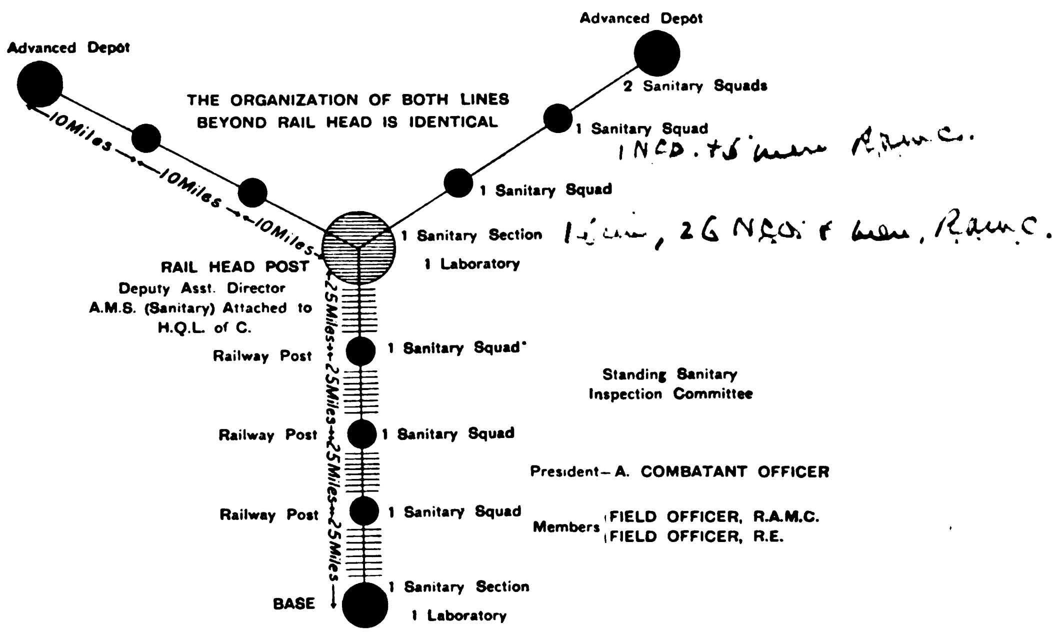
ARMY TROOPS.

HEAD QUARTERS OF THE ARMY.

Assistant Director, A.M.S. (Sanitary) with Army H.Q.

Regimental or Company Sanitary Squads and R.A.M.C. for Water Duties, strength per Regiment as above, and at rate of 2 per Company for R.E., and similar units.

Regimental or Company Sanitary Squads and R.A.M.C. for Water Duties, strength per unit, as above.



may, especially where the base includes a large seaport, be aided by one or more assistant sanitary officers. He will be entrusted with the duties of port sanitary officer, with a view to preventing the introduction of infectious disease from transports, and he will arrange for the segregation of cases of infectious disease and of "contacts" when this last measure is considered necessary.

With an inland base in India, the sanitary officer would usually be the senior medical officer of the nearest cantonment.

(3) *Sanitary Posts.*—The responsibilities and duties of the military commandant of a section or post, sanitary officer, sanitary sections, and sanitary squads, are as follows:—

(*a*) *Duties of Commandant.*—The commandant is responsible for the sanitary condition of the area under his control, just as the commander of a field unit is responsible for the area occupied by the troops under his command.

(*b*) *The Duties of Special Sanitary Officer.*—The duties of a sanitary officer in charge of a district are analogous with those of the medical officer of health of a city or borough, and include the supervision of (1) food and water supplies; (2) the disposal of sewage and refuse; (3) disinfection; and (4) all measures necessary to prevent the introduction and spread of disease.

(*c*) *Duties of a Sanitary Section.*—With an Imperial Army a sanitary section corresponds to the personnel attached to the office of a medical officer of health in civil life.

The N.C.O. and men will act as sanitary inspectors and carry out skilled sanitary work, such as disinfection, and will also, in addition to the sanitary duties of civil life, act as sanitary police.

With Indian Forces, the duties of sanitary sections are laid down as follows:—

(i) Supervision of water-supplies, including their protection, purification, and distribution. Apparatus and chemicals required for these purposes will be in charge of each section.

(ii) Supervision of food supplies, cooking, and slaughter places, and disposal of waste water and refuse.

(iii) Disinfection.

(iv) Supervision of ablution places and disposal of waste water.

(v) Conservancy, refuse disposal and camp cleanliness, including that of animals' lines.

(vi) Sanitation of camps, of hired transport, camp bazaars, railway stations, camp and sites for troops passing through.

(vii) Sanitation of routes between camps and posts, and the disposal of carcases, &c.

(viii) Carrying out sanitary schemes which are beyond the power of regimental sanitary detachments.

(ix) Acting as sanitary police.

On mobilization being ordered, or before this if necessary, General Officers commanding divisions will be informed of the number of sanitary sections to be furnished, the destination of each, and the required date of its arrival there. On receipt of these orders the requisite native establishment for each section will be entertained—preliminary arrangements for this having been already made by general officers commanding divisions—and the sections formed, equipped and dispatched under their own medical officers. On arrival at destinations the sections will at once assume such sanitary duties as may be ordered, and will receive any necessary transport.

It is of the utmost importance that sanitary sections should have everything in readiness before main bodies of troops, &c., arrive at the several camps, and they should therefore invariably proceed with the most advanced troops.

(*d*) *The Duties of a Sanitary Squad.*—A sanitary squad will:—

(i) Execute skilled work in connection with (*a*) disinfection, (*b*) the provision of pure water, including its collection, distribution and storage, and (*c*) construction of incinerators.

(ii) Supervise the work of permanent fatigue parties employed for conservancy or other work in connexion with sanitation.

(iii) Act as sanitary police. For this purpose the N.C.O's and men are invested with the authority of military police and wear a police badge.

(iv) Where a post has a railway station under military control the squad will exercise sanitary supervision over the water supply to troops passing through, and over the conservancy arrangements generally.

(III) *The Sanitary Inspection Committee.*—On the mobilization of a field force being ordered by the Army Council, a Sanitary Inspection Committee will be formed, consisting of:—

President: A Senior Combatant Officer.

Members: A Field Officer, Royal Engineers, a Field Officer, Royal Army Medical Corps.

This Committee will, in a general sense, perform duties similar to those of the Local Government Board of the United Kingdom in relation to sanitary matters.

Its President will receive the instructions of the Commander-in-Chief through the Director of Medical Services.

The functions of the Committee are defined as follows:—

(1) To assist commanders and the medical service in their efforts to maintain the health of the Army, not only by co-ordinating the work of the different military branches, but also by co-ordinating the military with the civil sanitary organization of the country or area it occupies.

(2) To initiate important schemes of general sanitation and to serve as a board of reference for the solution of sanitary problems.

(3) To visit and inspect stations occupied by troops, to advise local authorities regarding necessary sanitary measures, and to further in every way the maintenance of satisfactory sanitary conditions, reporting

16

to the Director of Medical and Sanitary Services any measures they consider necessary, but which they cannot arrange to carry out locally.

(4) To ascertain what sanitary appliances and materials of all kinds are required for the Army, and that an adequate reserve of these materials and appliances are maintained.

No similar organization is provided for an army having its base in India.

Such is the present sanitary organization for both the Imperial and Indian armies.

These schemes have, of course, only been evolved since the South African War, and have yet to bear the test of experience.

So far as they can be judged, they provide for well-nigh perfect sanitary services in theatres of war.

An integral part of the system is, it will be observed, a specialized rank and file trained to carry out skilled sanitary work.

We will now consider the sanitary lessons to be learnt from a recent campaign in the Orient, and find that the methods of the Japanese in the war selected are well worth studying, as they secured such extraordinary immunity from disease, that while nearly twenty-two cases of sickness were admitted to hospital from the British forces in South Africa for each wounded man during a period of thirty-one months, only one and a half cases of disease were admitted for each wound from the Japanese forces in Manchuria during a period of eighteen months. (*Vide* the following table.)

Nature of comparison	Japanese Forces, Manchuria (1904-5) Period of 18 months	British Forces, South Africa (1899-1902) Period of 31 months
Admissions from wounds. Annual ratio per 1,000 mean strength	391·6	34·2
Deaths from wounds, including killed. Annual ratio per 1,000 mean strength	137·3	14·4
Admissions from disease. Annual ratio per 1,000 mean strength	589·6	727·0
Deaths from disease. Annual ratio per 1,000 mean strength	41·2	24·4
Admissions for enteric and dysentery. Annual ratio per 1,000 mean strength	47·6	138·7
Percentage of deaths from wounds amongst admissions for wounds	5·6	11·2
Percentage of deaths from disease amongst admissions for disease	5·8	3·3
Percentage of deaths from enteric fever and dysentery amongst admissions for enteric and dysentery	33·4	12·0
Proportion of killed to wounded (officers and men). Admissions only	1 to 3·4	1 to 3·6
Proportion of admissions for wounds to admissions for disease	1 to 1·5	1 to 21·8
Proportion of deaths from wounds, including killed, to deaths from disease	1 to 0·3	1 to 1·7

The first thing which strikes the student on considering the sanitary history of the Russo-Japanese War, and comparing it with the elaborate sanitary service which has been evolved for our own Army, both at home and in India, is that no such organization existed so far as we know with either of the armies in the great struggle in the Far East.

In the Field Medical Regulations of the Japanese Army there is no chapter which is specially devoted to the sanitary duties of the Medical Service, nor are there any specific paragraphs relating to these, except such as deal with the disinfection of trains and ships, and the manner of disposing of the bodies of those who have died from infectious disease (Medical and Sanitary Reports, p. 13).

Our sanitary information with regard to the two great armies involved is widely dissimilar as may be gathered from the facts, that out of forty-nine reports contained in the valuable volume of "Medical and Sanitary Reports," published by the War Office, forty-five deal with the Japanese and only three with the Russian Service.

Out of 571 pages of letterpress, 530 refer to the Japanese, and out of 107 maps and illustrations only one refers to the Russians.

Under the circumstances it is obvious that most of my remarks must refer to the Japanese Medical Service in the War, as our information with regard to the Russian Service is so meagre.

The Japanese Sanitary Service.

"The remarkable success of the Japanese in preventing disease in their armies during their war with Russia must be attributed, in large measure, to the fact that they accepted as a fact that their medical officers possessed superior knowledge of sanitary matters, and that having employed them as specialists in that line, they accepted their advice without question, gave the men, material and money, to carry out their suggestions and held them responsible for results."

The foregoing paragraph which I quote from the Address of the President of the Association of Military Surgeons of the United States Army, delivered at Washington in 1910, gives the keynote of such sanitary organization as existed in the Japanese Army.

Each medical officer, however employed, was an active and enthusiastic sanitarian, and the fighting men recognized him as such. He bound up their wounds, of course, when they needed it, and they were grateful for that service, but he taught them how to avoid getting sick, and they were far more grateful for that.

As no definite sanitary organization existed, the arrangements which were found so useful in the war with Russia may be considered under the following headings:—

(1) The training of the individual soldier in sanitation.

(2) The methods adopted to secure a pure water supply for the troops.

(3) The methods adopted for securing cleanliness of the person, the camp, and the battle-field.

(4) The organization for securing the provision of sound food and suitable clothing.

(5) The methods adopted to prevent the introduction or spread of epidemics.

Let us consider these several headings:—

(1) *The Training of the Individual Soldier in Sanitation.*—The essential difference between the system in the Japanese Army, and that which existed at home prior to 1905, and in India up till little more than three years ago, was that each individual soldier was trained in sanitation. In his interesting Report dated May 17, 1905, Captain Vincent, of the Royal Artillery, says: "In the Army it is recognized that the most effective way of preventing disease is by teaching the men to look after themselves.

"In peace time every Saturday a medical officer of a battalion lectures to the men on disease, and tells them of the awful results of *not* taking sanitary precautions. In war time the same thing takes place at least once a month. (Indeed the Army Orders issued in May, 1905, directed that these lectures should take place *twice* monthly.) "In addition to this, the company and section officers pay great attention to the health of their men, and take every opportunity of talking to them on the subject. They tell them that it is a shameful thing for a soldier when fighting for his country to get ill, and *that disease is a far more dangerous enemy than the Russians.*

"They impress upon them that in war everything depends on the spirit, and if the spirit is weak, disease attacks" (Report No. 2).

The lectures and instructions to the men on sanitation referred to by Captain Vincent were generally intended to amplify a pamphlet which was issued to every Japanese soldier on mobilization, entitled "Health Memoranda for the Use of Soldiers in Time of War."

It consisted of a brief introduction and seven sections on the following subjects:—

(*a*) Instructions regarding the care of the body.

(*b*) Instructions regarding clothing.

(*c*) Instructions regarding food and drink.

(*d*) Instructions regarding marching.

(*e*) Instructions regarding quarters.

(i) When quartered in houses.

(ii) When in tents and bivouacs.

(*f*) Instructions for preventing diseases during the march.

(i) Frost-bite.

(ii) Sunstroke.

(*g*) Instructions regarding infectious diseases.

The brief introduction is so much to the point that I venture to quote it.

It says: "Officers commanding regiments are responsible for the health of their soldiers; but each soldier must himself look after his own health. Thus the hygiene of the soldier consists, first, of that for which the commanding officer is responsible; secondly, that for which the soldier *himself* is responsible, and each must help the other.

"These are memoranda on personal hygiene and not on public hygiene. The soldier must read and remember them, and even during the most severe fighting he must do everything in his power to preserve his health."

The pamphlet consisted of thirty-nine pages, and company officers were directed to read it to their men frequently. In April, 1905, Colonel Macpherson reported that many men had lost their copies, but all non-commissioned officers possessed theirs.

The instructions with regard to the prevention of sunstroke and frost-bite, are remarkably clear and easy to follow, whilst those regarding infectious disease are equally good.

The following were the instructions for the prevention of infectious disease:—

(1) Infectious diseases have their origin outside the body, and on this account they should be easily avoided if proper measures be taken. The germs that cause them are living organisms, although they are too small to be seen with the naked eye. When they enter the body they develop rapidly and cause serious disease. The history of all wars tells us that the number of men who succumb to these diseases is greater than those killed by the enemy. All the staff officers take special precautions to prevent infection on this account, and the soldiers must help them by strictly following the instructions.

(2) Both in peace and in war, the chief infectious disease affecting soldiers is enteric fever. The germ of the disease enters the body with the food and drink. The first thing to do, therefore, is to eat and drink nothing that is not cooked. The germ also exists in the bedding and clothing, and in the dirt on the hands and fingers. Therefore the under-clothing must be kept clean, the outer clothing well brushed, and the hands must be washed before eating, if this is possible.

(3) The germs of dysentery and cholera also enter the body in the same way as the germ of enteric fever, therefore the same precautions must be taken. Unripe fruit is apt to cause dysentery, and must not be taken when dysentery is prevalent.

(4) Small-pox is still prevalent in China and Korea. Houses occupied by persons suffering from this disease must be avoided, even by those who are well vaccinated.

(5) Plague always enters the body through small cuts or sores. Therefore, when this disease is prevalent, do not neglect even the smallest cut, and the surgeon should be consulted regarding it. It is very dangerous at such a time to walk with bare feet. Gloves should also be worn.

Rats and flies carry the disease germ, therefore keep them away from the food, &c.

(6) Malaria fever is given to men by mosquitoes. Mosquito nets must, therefore, be used where there is malarial fever.

(7) The venereal diseases are gonorrhœa, syphilis and soft chancre. They are contracted by intercourse with infected women. The prostitutes in China and Korea are full of infection; therefore avoid them, so that the world may not know your shame, nor your children suffer.

(8) There are several infectious diseases of the eye, but the most dangerous is trachoma or Egyptian ophthalmia. Men are attacked by these diseases by using washing basins and towels in common. This practice must, therefore, be avoided when such disease prevails. But when it is impossible to have separate basins, &c., rinse out the basin before using it. Anyone who touches his eye with the discharge of gonorrhœa will probably lose his sight. (Report 26.)

I think that you will all agree with me that these instructions are remarkably clear and concise.

(2) *The Methods adopted to Secure a Pure Water Supply.*—In his Report above referred to, Captain Vincent says: "I think that the extraordinary absence of sickness in this army is largely due to the fact that there have been none of the usual campaigning difficulties with regard to water."

Be this as it may, the authorities took no risks in the matter, and the Health Memoranda, above referred to, says that: "Uncooked food and unboiled water frequently contain the germs of disease and must be avoided.

"Although a soldier may have previously been accustomed to drink water from wells, pipe supplies, streams and springs without boiling it, he must acquire the habit in war of boiling water before drinking it."

Captain Vincent says that Japanese soldiers, if they cannot get tea, seem to be fond of hot water as a beverage, and for this reason water is not, as a rule, boiled in large quantities with a view to allowing it to get cold.

After the Battle of Mukden, Divisional Orders were published with regard to this subject, to the following effect:—

"Soldiers must boil water before drinking it. Any soldier who neglects to do so will be made a prisoner, and no excuse will be listened to. The means for boiling water must always be kept ready by the soldier himself. Stations will be formed at various places where boiled water may be obtained.

"Boiled water must always be kept at stations where the rations are distributed for the use of the men coming from units to draw rations." (Report 30.)

These "boiled water stations" were a feature of the campaign. They were formed in accordance with an Army Order, issued in May, 1905. (Report 30.)

Colonel Macpherson gives an account of one of these, which consisted of a Chinese fireplace and a cauldron in one of the temples: "Water was boiled here and benches placed in the yard for the soldiers to sit on and rest. The boiled water was placed in old beer and other bottles, and a notice was placarded up outside the temple saying, 'From 8 a.m. to 8 p.m. tea may be obtained here.' In other words, the boiled water distribution station had been converted into a tea house, such as is found on the roadside anywhere in Japan.

"The tea was supplied by the *intendance* officer of the battalion, whose duty it was to maintain the water station. Many similar stations have been established in accordance with the orders on the subject, and they are all much of the same character. No special apparatus is used for boiling the water, and the arrangements are of an improvised nature." (Report 31.)

The quantity of tea issued was small and was used over and over again, so that although a man was said to be drinking tea he was practically drinking hot water.

Not only was all drinking water boiled, but when cholera was feared, an order was actually published in May, 1905, saying that "All water used for brushing the teeth must be boiled or passed through an *Ishiji filter*." (Report 27.)

The Ishiji filter, which was a special Japanese invention, was only issued after the army had been fourteen months in the field. It consisted of a canvas cone on a metal ring with two outlet sleeves, let in midway between the apex and middle of the cone. These sleeves acted as outlets for filtered water, and each contained a metal cylinder filled with granulated charcoal and a sponge.

The water to be filtered was mixed with two powders. One consisted of aluminium silicate and permanganate of potash, and the other, which was added after the water had been thoroughly mixed with the first named powder, consisted of aluminium silicate and hydrochloric acid.

This apparatus was said to give excellent results, but it may be practically disregarded as a safeguard against water-borne disease, as it was only introduced quite late in the campaign, so that we may say that what has been appropriately called the "tea-kettle policy" was relied on throughout the severest stress of the war.

The manner in which the Japanese soldier observed this policy, almost like a religious observance, may be gathered from the following note by Colonel Macpherson: "On my march up to join General Nogi I had a small escort of cavalry soldiers with me. On arriving at the Liao River I decided to lunch on its banks. The water in the river was not inviting, but I would have drunk it and so would any British soldier. Not so the Japanese. One of the cavalry men collected all our water-bottles, got on his horse and rode back some quarter of a mile to the *etappen* station, where he knew he could find boiled water, and there filled them and returned." (Report 22.)

The same officer, referring to the sentries, who we are told were posted on wells not fit for drinking purposes, says that: "Those responsible trust a great deal to the common sense of the men themselves, and to the careful instructions they have received in (sanitary) matters in peace time.

"All this, coupled with the good influence of the older soldier, has the desired effect. However, that some men will, when thirsty, try and get water anywhere they can, I have ample proof. A battalion passed through a village in which we were quartered.

"The men had evidently marched a long way, and were hot, thirsty, dusty and tired. In passing a well, in which I know the water was not good, some of them tried to fill their water-bottles, and would have done so had not their company officers prevented them." (Report 32.)

With drinking water, as with everything else, the responsibility of seeing orders complied with comes down to the company commander.

The manner in which he performs his duties was gauged in the campaign by carefully kept statistics.

In other words the efficiency of a Japanese captain was judged not merely by his valour in leading his men against the Russians, but also by his ability to keep them on the alert against more insidious and formidable enemies in the form of disease germs.

(3) *The Methods adopted for Securing the Cleanliness of the Person, the Camp and the Battlefield.*—(*a*) *The Person.*—Japanese soldiers are naturally very clean in their habits, and Captain Vincent tells us that during the campaign they always contrived to bathe every other day even in the coldest weather.

In the Health Memoranda it was pointed out to them that even such trivial complaints as whitlow, boils and toothache reduce the fighting power of an army. These occur most frequently from the soldier being too lazy to clean himself.

He must, therefore, be careful to cleanse every part of his body even in the field. Specific instructions were given as to carrying out these orders, and especially the necessity for cleansing the hands in war time was emphasized. "Dirt under the nails," the men were told "often contains the germs of disease. The nails must, therefore, be cut short at suitable times, but they should not be cut too close, otherwise inflammation under the nails is apt to occur."

(*b*) *The Camp.*—We have all heard of the Japanese belief that their ancestors hovered round their camp fires and that, therefore, the camps should be kept in a state worthy of visits from these sainted relations.

This may have had something to do with it, but certainly there appears to be no doubt that cleanliness of environment was, equally with cleanliness of the person, a leading characteristic of the Japanese soldier throughout the war. Colonel Macpherson says "Anyone who has seen a Chinese village in its natural state knows what a collection of filth and dirt it represents.

"Well, in all villages in which the Japanese soldiers were quartered cleanliness had completely ousted such a horrible state of things."

(c) *The Battlefield.*—There are two principal sects in Japan; one of these cremates its dead, but the other enjoins burial.

In the field, however, all corpses were cremated on sanitary grounds, but in order not to offend the religious scruples of the enemy, the Japanese did not cremate the bodies of Russians except in the case of infectious disease.

The method of cremation adopted was to lay the corpses on a pyre, and cover them with wood or branches of trees, pour petroleum over them, and set fire to the whole structure.

There can be little doubt that cremation is far more sanitary than the hurried burial which has formed the means of disposal of dead in European wars, and that its adoption contributed very considerably to the cleanliness of the battlefields in the Far East.

(4) *The Methods adopted to Secure Sound Food and Suitable Clothing.*—(a) *Food.*—The Japanese soldier was told in the Health Memoranda, to which I have previously referred, that food is the source of bodily strength. In war the body is especially in need of strength, and therefore more food must be taken, as in consequence the soldier marches better, can stand cold better, and resists disease better.

Excess must of course be avoided, and when the body is fatigued or hot after exercises it is best to wait a little before eating.

Flies he was told are the chief intermediaries in spreading cholera and he was, therefore, not only to take every means to destroy them, but to actually avoid food on which flies had settled. If he was obliged to eat such food, he was told to cook it over again.

All eatables offered for sale to the troops had to be passed by medical officers as fresh and free from parasites, and kept protected from dust and flies.

All articles of food were required, by Army Order of May, 1905, to be cooked.

Lieutenant-General C. J. Burnet, C.B., reports that the food of the Japanese soldier was good, plentiful and varied, and both tea and tobacco being weak the men's nerves were not affected by their excessive use.

"The men all take it in turn to cook, but as the cooking is so simple there is no difficulty in this.

"I noticed that all guards have their meals cooked at the kitchen nearest their post.

"From the highest to the lowest, the greatest attention is paid to the feeding of the men. A General who has had much to do with conducting the affairs of the whole Japanese Army now in the field has recorded his opinion that he considers the great attention which has been given to the proper feeding of the men has, as much as anything else, contributed to their freedom from sickness. The Japanese

thoroughly realize the principle that prevention is better than cure." (Report 41.)

(*b*) *Clothing.*—Perhaps the most explicit and detailed of the Health Memoranda issued to soldiers were those relating to clothing.

They pointed out that the chief effect of clothing is to prevent cold and that the principal article to be used for this purpose was the greatcoat. The soldier was instructed how to take care of it and also that it was as necessary to keep the underclothing as clean as the body itself, as the shirt, drawers and socks absorbed dirt from the body and must, therefore, be frequently washed.

Footwear came in for special consideration as the Memoranda declared that "the military boot is to the infantryman what the horse is to the cavalryman. It must, therefore, be kept as carefully as the horse."

Special instructions with regard to socks were given, and the necessity for having them sound and in good order was insisted on. Where they became worn out and could not be replaced the Continental plan of using bandages as a substitute was recommended.

Lieutenant-Colonel Hume, D.S.O., of the Royal Artillery, has submitted a special report on the clothing which is worth reading by all concerned with the clothing of soldiers. The summer clothing has apparently small claim to call for special mention, but the winter clothing is described as excellent, and Colonel Hume considers that it was "largely due to its good quality that the men have been practically immune from the effects of the cold." (Report 43.)

Mosquito nets were used and supplemented by mosquito head nets or veils which were worn as a protection against flies and mosquitoes. (Reports 22, 23.)

An abdominal sash or cholera belt was insisted on as an essential article of clothing at all times.

(5) *Special Methods adopted to Prevent the Introduction of Epidemic Diseases either into the Army or the Home Territory.*—There can be little doubt that the arrangements for the prevention of epidemic disease in the Japanese Army were very complete.

The Regulations provide that where an outbreak exists, or is anticipated, the Officer Commanding the Station will appoint a Committee to undertake the whole matter of preventing the introduction of the disease or its spread.

The Committee consists of :—

(*a*) Two senior medical officers.

(*b*) One regimental officer.

(*c*) One *intendance* officer if necessary.

The Regulations make provision for the establishment of infectious disease hospitals with four classes of wards.

(*a*) For suspected cases.

(*b*) For light cases.
(*c*) For severe cases.
(*d*) For convalescents.

Elaborate rules for disinfection were laid down and no detail necessary to ensure the complete destruction of disease germs in and on the patient and his surroundings were overlooked.

All corpses of infectious cases had to be carefully disinfected and the orders were that they should be burned where possible. Burning, steaming and boiling were the disinfecting agents chiefly relied on, but, where these were impracticable, mercuric chloride 1 in 1,000, 20 per cent. carbolic acid, and quick lime were the chemical agents most in favour.

Not content with safeguarding the troops in the field, the Army Medical Service established quarantine stations to safeguard the Home Territory.

Lieutenant-General Ishimoto in his instructions with regard to the stations pointed out, with pardonable pride that during the eighteen months of the War, the Army had been so fortunate as to escape contagious and infectious disease and that it would be "a deplorable circumstance if the troops returning from the front brought back any epidemic disease with them thereby sacrificing in vain the lives of those who had returned crowned with success. Moreover such a disaster might spread to their units, and from their units to their homes, and from their homes to their towns and villages, and lastly to the country itself. Consequently all officers, men and civilians were asked to bear in mind the object aimed at, and subject themselves to quarantine examination and disinfection in accordance with the instructions, endeavouring thereby to ensure, on the one hand, the safety of their own persons and on the other, prevent their countrymen falling victims to camp epidemics.

These quarantine stations provided for the disinfection of the entire kit and equipment of the soldier and the provision of a hot bath for each individual. The organization was so complete that a whole battalion was passed through the quarantine station in four hours. Officers went through the same process as their men, but had separate baths and waiting-rooms.

There were three of these stations established in connexion with the great ports of Japan, the largest and most important of which had a staff of over 800 officers and men.

With this brief reference to this special institution of the Japanese to protect themselves against their own soldiers, I must pass from this sketchy account of the Japanese methods of preventing diseases in the Army in the field to a brief consideration of

The Russian Sanitary Service.

With regard to the Russian Army we have, unfortunately, very little information to go on.

In a report by Major J. M. Home, 2nd P.W.O., Gurkhas, we learn that a selected combatant officer on the staff of the Commander-in-chief was designated Chief Sanitary Inspector of the Manchurian Army. Under his orders was a Surgeon-General, who was responsible for the preservation of the health of the Army.

The Surgeon-General dealt with a sanitary department, which was apparently distinct from the medical department. He was also the head of the veterinary service.

Directly under his orders were two military hygienists who reported on all hygienic measures. One of these was at Harbin and the other with the Army in the field. There was also a civilian bacteriologist under orders of the Surgeon-General.

Each Army corps had a corps surgeon, and sometimes a corps sanitary officer. The latter was responsible for the supply of food, horses, carts, personnel, &c., and generally for sanitation, but he had nothing to do with the treatment of sick and wounded.

Each division had a chief surgeon with a sanitary inspecting officer, but the latter was apparently mainly responsible for the routine administrative work.

Major Home informs us that five special sanitary and ten disinfecting detachments were formed.

Each detachment was to consist of four bacteriological specialists and to be furnished with a laboratory in which the most minute bacteriological investigations could be carried out. Presumably the detachment had a personnel in addition to the specialists, but the report is silent on this point.

These detachments were all stationed on the railway south of Harbin.

In the event of any doubtful case of epidemic disease occurring the nearest sanitary detachment would proceed to the spot, carry out the necessary bacteriological investigations and preliminary disinfecting measures.

A disinfecting detachment would immediately follow the sanitary detachment, and if the bacteriological investigations showed the existence of a serious infection it would carry out the more serious disinfecting measures.

It was proposed to employ these special detachments, if not required for their legitimate work, in examining and taking measures for purifying water which the Army had to use for drinking purposes (Report 46).

Colonel Waters, of the Royal Artillery, in a special report on the health of the Russian troops, says that he was told "that the health of the Army had suffered very considerably, partly on account of exertion and exposure and partly owing to polluted water and the utter absence of any sanitary arrangements whatever."

He concludes his interesting report as follows: "I had originally expected that there would be a terrible amount of sickness, but after

living with average troops for several months, I believe that the losses due to this cause were small, notwithstanding the great hardships, foul water and utter absence of any sanitary arrangements."

The last phrase of the Report is the one with which we are most concerned.

Having detailed to you the elaborate precautions of the Japanese the "utter absence of any sanitary arrangements" in the lines of their European antagonists is a matter that speaks for itself.

In the Russian Army the proportion of sick to the wounded was one man wounded to four or five admissions for disease, whereas in the Japanese Army the proportion was 1 to 1·5 or nearly four times as good.

We did better than the Russians in South Africa, so we have nothing to learn from their sanitary story in Manchuria.

We have, however, great and important lessons to learn from our Japanese allies. Briefly stated they are these :—

(1) The Japanese experienced the horrors of war due to the careless sanitation during their campaign with China. They profited by the lesson, and at once drew up simple and suitable rules for the guidance of their soldiers as to the preservation of their health in the field.

(2) These rules and regulations had been so inculcated into the minds of all concerned that they had become household words with them.

(3) The individual soldier had been made to understand that he is only of use to his country when fit and well. That if sick, not only is he useless, but he is an encumbrance.

(4) The national spirit had been so fostered that he would not allow any indulgence or neglect of rules to impair his fighting efficiency.

(5) Lastly, but perhaps most important of all, the older soldiers had been trained to keep the few waverers in the right way.

Colonel Macpherson, to whose reports, not only the present writer, but the whole Army is indebted for our knowledge of the sanitary aspects of this remarkable campaign, concludes that when you once get the ranks of an army imbued with these lessons, you have no need for the constant supervision which under existing circumstances is essential in our own Army both at Home and in India.

When all European and Indian officers and men realize, as the Japanese did, that sanitation is the first essential of an army in the field, and that training in sanitary details is every whit as important in peace time as training in other military exercises, I venture to predict that in future campaigns we shall hear no more of the so-called Sanitary Scandals of War.

Reviews.

Fourth Report of the Wellcome Tropical Research Laboratories. Vol. A, Medical. 1911. Andrew Balfour, M.D., &c., Director.

This volume resembles its predecessors in the wealth of original matter which it contains, and in the excellence of its plates, printing and paper.

Colonel H. B. Mathias, D.S.O., R.A.M.C., reviews the measures undertaken to check the advance of sleeping sickness in the Southern Soudan. He believes that *Glossina palpalis* and *G. morsitans* have a much wider distribution in Lado than was supposed. It is probable that a tract of country 80 by 50 miles in area is infected.

Captain L. Bousfield, R.A.M.C., has studied six cases of relapsing fever, in one of which *Pediculus vestimentorum* was the probable carrier. These men had been bitten by bugs, *Cimex lectularius*, which Nuttall has shown to be capable of conveying spirochætes from mouse to mouse. No spirochætes, however, were discovered in bugs collected from the vicinity of these patients. Dr. Balfour regards the spirochæte of Egyptian relapsing fever as not identical with those causing the true African, American, European and Indian diseases. The differences between these varieties are concisely tabulated. A bibliography adds to the value of this useful paper. His study of the crisis and of the effects of salvarsan in spirochætosis of Soudanese fowls has led to curious results, the importance of which is great. Infected chicks were given salvarsan. As soon as the parasites had almost disappeared from the peripheral blood, examination of that taken from the liver, spleen or lung under dark-ground illumination showed that it was swarming with spirochætes in which were highly refractive granules. Some of these spirochætes attracted the attention by their violent contortions which ended in the sudden discharge of these shining particles from one or other extremity. The spirochæte finally became reduced to an inactive empty sheath. Captain W. R. O. Farrell, R.A.M.C., and Dr. A. Balfour reported similar observations on granule shedding of the *Treponema pallidum* in the Journal of the Royal Army Medical Corps, September, 1911. The contribution by Dr. Balfour on the fallacies and puzzles of blood examination is of great practical value since he enumerates and illustrates various objects of not infrequent occurrence in blood-films which are not noted in text books. He quotes the well authenticated instance of cotton fibres being mistaken for filaria. The preventive measures which were deemed necessary entailed an expenditure of several hundred pounds. The plasmosomes of Ferrata, or Kurloff's bodies in a leucocyte, may be mistaken for Leishman parasites. Lieutenant W. E. Marshall, R.A.M.C., discovered Leishman bodies in the peripheral blood of thirteen cases of kala-azar out of fifteen examined. Though he seldom found more than one parasite in a slide. He infected monkeys by intra-peritoneal inoculation with human splenic blood, but he was unable to convey the disease to dogs. The bug, *C. rotundatus*, has not been procured in the infected

districts. Experiments with *C. lectularius* failed. Captain R. G. Archibald observed a diminution of the alkalinity of the blood of four kala-azar patients. This was to be expected since a similar reduction of the alkalinity occurs in all cases of pronounced anæmia. He noted some improvement in the condition of a boy suffering from kala-azar after intra-muscular injections of salvarsan. Unfortunately this treatment has failed in the majority of cases reported.

Dr. Balfour and Captain D. S. B. Thomson describe two instances of keloid-like growths in which Leishman bodies were detected. Archibald has met with a somewhat similar condition. He isolated from the blood of three patients who were suspected to be suffering from enteric fever, a bacillus which fermented dulcit and glucose, and produced alkalinity in milk. In these respects it resembled *B. paratyphosus* B. The autogenous vaccine was employed with success in one case.

The water supply of Khartoum is derived from artesian wells 70 metres deep. The bacteriological purity is of a very high order. Dr. Balfour lays stress on the importance of the *B. coli* as an index of contamination. It was not until an impermeable lining had been introduced into the bore-hole for five-sixths of its length that this organism disappeared. The strata are oblique and have out-crops on the river banks near native villages.

C. B.

Supplement to the Fourth Report of the Wellcome Laboratories.

This volume is the second review of recent advances in tropical medicine, hygiene and veterinary science. It is a monument of industry, and gives a *résumé* of everything of importance published since the date of the first review. It is invaluable as a work of reference to all practitioners residing abroad, even to the inquirer within reach of well-equipped medical libraries it will prove of great service, for a search in its pages will save him the labour of seeking for the original papers.

C. B.

For and Against Experiments on Animals. Evidence before the Royal Commission on Vivisection. By Stephen Paget, F.R.C.S. London: H. K. Lewis, 1912. Pp. xxxii and 344. Crown 8vo. Price 3s. 6d.

This volume has been compiled by Mr. Paget on behalf of the Research Defence Society and makes most interesting reading.

After an introduction by the Earl of Cromer, the Act of 1876 is explained, and the work of the Research Defence Society described. Then follows a summary of the evidence given before the Royal Commission, both for and against vivisection.

The impression left on one after reading this excellent summary is the extraordinary ignorance of fact, the misrepresentation or the blind and narrow-minded adherence to "principle" displayed by many of the witnesses.

We may quote what Lord Justice Fletcher Moulton says in his evidence. After referring to some "absolutely false" poster, he proceeds, "It is not surprising that a great number of people join this organization (anti-vivisection), because they get their ideas from these very serious misrepresentations. They believe themselves to be humane, but

when one realizes the evil that ignorance does, and that the only way in which ignorance can be removed is by the experimental method, and the enormous advantages in the way of saving pain that these results have produced, one must feel that the truly humane men are the people who are defending scientific research." The last chapter gives a summary of the Report of the Royal Commission.

J. C. K.

INDEX OF DIFFERENTIAL DIAGNOSIS OF MAIN SYMPTOMS. Edited by Herbert French. Bristol: John Wright and Sons, 1912. Pp. xii and 1017. Price 30s. net.

This is a handbook for the use of practitioners and serves as a book of reference on those numerous occasions when we come across a symptom or group of symptoms which we are at a loss to explain or which are so far unusual that we feel we would like further light on the matter. Each symptom is taken up in turn and the various conditions in which it is found are discussed with reference to differential diagnosis, whilst at the end of the book there is an extremely copious index running to 166 pages. This is a special and very valuable feature of the treatise, it acts as a cross reference and enables one with the least difficulty to find references to all the other symptoms which may be present in any particular disease. The information that is given is full and the names of the twenty-two contributors are sufficient guarantee that it is reliable. It is somewhat invidious to single out any particular article, but as an example of the great value of the book one might draw attention to the article on Constipation, by Dr. Hertz, which should provide a wholly new outlook on this subject to those who are not already familiar with Dr. Hertz's work.

The editor asks for criticisms and if any are to be made one might say that the weak part of the book is in references to tropical disease, which is a pity, since tropical diseases are just the sort of things which are likely to puzzle practitioners in this country. For example, in the article on Diarrhœa, sprue is mentioned as a possible cause in old tropical residents, but no mention is made of chronic dysentery, which is very many times more frequently a cause of chronic diarrhœa in such subjects. Again in the article on prolonged pyrexia the classical undulant type of Malta fever is mentioned, but not the much more puzzling cases where there is a hectic type of fever with drenching sweats and which resemble acute tuberculosis so much. The description of the ankylostoma ovum with "the coiled up embryo parasite" would only apply to fæces that had been kept a few days and does not tally with the pictures on p. 94.

Apart from these comments we have nothing but praise for the book, which will be immensely useful and should have a wide circulation.

W. S. H.

A MANUAL OF SURGICAL TREATMENT. By Cheyne and Burghard. Longmans, Green and Co., 1912. Pp. xxviii and 570. Price 21s. net.

This is an old friend revised and largely re-written by Messrs. Legg and Edmunds.

It is published in five volumes, of which the first two volumes are now issued, and their arrangement follows on the lines of the previous edition.

The first volume opens with chapters on Inflammation, Suppuration and Ulceration. These conditions are defined and classified, while the appropriate treatment suitable to their various phases are most fully given.

It is in the descriptions of treatment that this manual so pre-eminently excels, and one finds that in connection with inflammation the benefits to be derived from the use of leeches, cautery and bleeding have not been omitted, while more modern methods of treating this condition, such as Bier's appliances for local hyperæmia, have been given more notice than is usually to be found in English works on surgery.

There are six chapters devoted to Wounds, their complications and treatment. These are prefaced by much useful information on operations and their management, but the methods here recommended for the sterilization of sponges and dressings show a lack of confidence in modern aseptic technique.

In the chapter dealing with the treatment of incised wounds, the use of antiseptics is again insisted upon; and it is stated that in private practice the aseptic plan is almost impossible. Surely this is a too conservative view of the subject, and does not represent the experience of all surgeons.

Chapter XI. is devoted to the consideration of syphilis, and the use of salvarsan is well treated by Dr. D'Este Emery.

An account of the older methods of treatment by mercury is not forgotten, and some tables from the "Manual of Venereal Diseases," by Royal Army Medical Corps officers, are given as guides to the treatment of this disease by mercury pill and inunction. The treatment followed till recently at Rochester Row of injections of metallic mercury is also clearly given, and the formula for Lambkin's cream is included.

Chapter XII. gives a review of tuberculosis from a surgical standpoint.

The next chapter deals with tumours, which are classified according to their histological characteristics. Here the authors emphasize the point that when making an exploratory incision in a case of suspected malignant disease, the possibilities of infecting the wound from the growth and of disseminating the disease must never be lost sight of.

The remaining six chapters of this volume are devoted to deformities. The subject is exhaustively treated.

In regard to hammer-toe, the removal of the head of the first phalanx is strongly advised in all but slight cases, while amputation of the deformed digit is not recommended.

This volume is completed by an appendix containing chapters on anæsthetics and on the examination of the blood. The description here given of methods for the induction of general anæsthesia is excellent, but the short notice allocated to spinal and local analgesia is insufficient for the use of a beginner in these methods.

The chapter on the examination of the blood is very good; while not too long, it gives succinctly the necessary procedures to be undertaken for obtaining blood-counts, and describes most clearly various ways useful to obtaining blood for diagnostic purposes.

The second volume of this work opens with a chapter on affections of the skin and subcutaneous tissues, while affections of the lymphatics, their vessels and glands, are subsequently dealt with.

The diseases incidental to bursæ, tendons and muscles are next outlined, and the treatment appropriate to these conditions is fully indicated.

In the chapter on aneurysms, a very fair description has been given of Matas's operation for endo-aneurysmorrhaphy, and the obliterative and restorative methods are each described. Following this is an account of the operations used for the ligation of special arteries, such as the popliteal and internal iliac.

Division II. of this volume describes the surgical affection of bones and their treatments. This subject is particularly well done, and the authors seem to have balanced very nicely the counter claims for fixation and massage in the treatment of fractures, while the necessity for wiring in certain cases is clearly emphasized.

An excellent account is given of the treatment of the fractures more usually met with in general practice, and here a clear description of Hodgen's apparatus for fractured femora has been incorporated. This division of the volume is completed with chapters on tubercular disease in bone, actinomycosis, rickets and disorders of ossification.

Division III. deals with the general consideration of amputations. The present position of amputation in modern surgery is dispassionately discussed, and, thanks to the knowledge of asepsis, the excellent concluding chapters on set amputations are chiefly of historical value, except to the old-fashioned examiner or much harassed student.

Both these volumes are well and copiously illustrated, the print is large and the letterpress clear.

It would, indeed, be difficult to find a more useful guide to surgical practice than is contained in this revised edition of an old friend, the "Manual of Surgical Treatment."

J. W. H. H.

MICROBES AND TOXINS. By Dr. Etienne Burnet. Translated by Dr. Charles Broquet and W. M. Scott, M.D. London: W. Heinemann, 1912. Pp. xvi and 316.

This book is a translation of a publication in the "Bibliothèque de Philosophie Scientifique." It is intended to give a *résumé* of what is known up to date regarding the science of microbes and their toxins. The idea is well thought out and the consecutiveness of the idea is well maintained.

After dealing thoroughly with the biology of microbes and their *rôle* in nature, the question of pathogenic microbes is considered. This leads to a consideration of the part played in infection by the microbe on the one hand, and by the host on the other; and then follow several chapters on toxins and immunity. There is a very readable chapter on anaphylaxis, and the last three chapters deal with diagnosis, vaccines, sera, and chemical remedies.

There is a useful glossary of terms at the end and a preface by Professor Metchnikoff.

It is a big undertaking to give a comprehensive account of the subject which can be read and understood by others than bacteriologists, but the author has succeeded in placing before the public an eminently readable and very interesting book which will well repay perusal by even the specialist.

J. C. K.

FILARIASIS AND ELEPHANTIASIS IN FIJI. By P. H. Bahr. London: Witherby and Co. Price 6s. net.

In this first supplement of the *Journal of the London School of Tropical Medicine*, Bahr gives the results of his investigations into filariasis in Fiji, the report is very detailed and elaborate, and it is only possible to mention some of the leading points. Filariasis is extremely prevalent in Fiji, 64·8 per cent. of the male and 40·3 per cent. of the female population showing signs of infection in one form or another; of these, about half the cases show signs of filariasis, but no microfilariæ in the peripheral blood. Bahr suggests as possible explanations, that the adult worms may be immature, that they may be so situated that the larvæ are unable to enter the circulation, that the female may only produce larvæ at intervals, or that there may be only one sex of adults present; in seven cases the author has seen microfilariæ disappear, apparently permanently, from the blood; in each instance inflammatory phenomena and fever preceded the disappearance. The microfilariæ exhibit no periodicity, and although *Culex fatigans* is an efficient intermediary, the more usual one is *Stegomyia pseudoscutellaris*, which is the common mosquito of the Fiji group of islands; the author describes in great detail his experiments with this mosquito, as well as with *C. fatigans*, and others. With regard to the identity of the parasite, morphologically the microfilariæ are identical with *Microfilariæ bancrofti*, and Bahr thinks that from its general characters and from its absence of periodicity, it is the same parasite as "*Filaria philippinensis*," as described by Ashburn and Craig. The adult again is morphologically indistinguishable from *F. bancrofti*, for which the author has proved *S. pseudoscutellaris* to be an efficient carrier. Bahr suggests that the filaria of Fiji is really a *F. bancrofti* which has been modified in the direction of losing its periodicity. The rest of the monograph deals with the question of the relations of elephantiasis to filariasis.

The book is very fully illustrated, and represents the results of an enormous amount of painstaking work. One criticism might be made, and it applies to a very great number of medical writings, that is, that percentages drawn from a small number of cases are utterly illusory, and the labour spent in calculating them is wasted.

W. S. H.

Current Literature.

Beri-beri. — Schaumann (*Transactions of the Society of Tropical Medicine and Hygiene*, vol. v, No. 2, 1911) describes experiments which go to show that beri-beri is dependent on the absence from the diet of two substances: (1) Organic compounds of phosphorus; (2) a substance which is essential to phosphorus metabolism, and which acts as a catalase. The latter substance is found in rice, bran, rice polishings, meat, yeast; in certain grains, e.g., rye; and in certain beans (katjang-idjoe), &c. It can be extracted from these substances by alcohol and by 0·3 per cent hydrochloric acid, after previous treatment with acetone and ether; it is labile, and is destroyed by heating to excess, as in an auto-

clave or by prolonged keeping. Animals which had become paralysed after feeding on a beri-beri producing diet, could be restored with remarkable rapidity by the administration of the second substance, which Schaumann terms "the activator." Similarly animals fed on a beri-beri producing diet, plus a small quantity of the activator, do not develop paralysis, but they waste; whereas when rice polishings are added to a beri-beri producing diet the animals neither waste nor become paralyzed. Schaumann interprets these differences as due to the necessity for organic compounds of phosphorus in the diet in addition "the activator." He puts the position metaphorically, that the activator acts as the match to the fire—i.e., the organic phosphorus compounds in the first place, and that these in their turn communicate the fire to the other elements, the nitrogen compounds, carbohydrates, &c. One interesting property of the "activator" is that it acts as a powerful stimulant to the appetite, and Schaumann attributes the distaste produced by a diet of stored or overheated foods to the absence of "the activator."

Axel Holst at the same meeting showed that the beri-beri on Norwegian sailing ships began to appear in 1894, when the diet of the sailors was changed. Prior to that date they fed largely on rye bread, salt meat and peas. Wheaten bread was substituted for rye bread, and it was found experimentally that animals fed on wheaten bread developed neuritis, whilst those fed on rye bread did not do so. Similarly rations of tinned meat and fish were substituted for salt meat, these tinned foods were heated to a temperature of about 120° C., and when animals were fed exclusively on them they developed neuritis, whilst if they were fed on fresh boiled meat they did not get neuritis. Salt meat, however, when boiled for an hour at 100° C. was capable of giving neuritis when animals were fed on it exclusively. Lastly, as a result of the new regulations in 1894 there was a great reduction in the amount of peas in the sailors' diet, and Holst has shown (1907) that peas added to a diet which otherwise causes neuritis will prevent the disease from occurring. Lastly, Holst referred to the possibilities of there being a connection between beri-beri and scurvy—e.g., pigeons fed on polished rice get neuritis, guinea-pigs on the same diet get scurvy, and pigs which are fed on polished rice get both neuritis and scurvy; the latter also develop these symptoms when fed on the ordinary diet of Norwegian sailors. There is evidence, however, that although the diseases are closely allied in their pathology they are not identical; the antiscorbutic property is much more labile than the antineuritic property, and, whilst peas will prevent the neuritis of fowls, they will not prevent the scurvy of guinea-pigs; if, however, the peas are allowed to sprout they will prevent the scurvy of guinea-pigs, and this antiscorbutic property is not destroyed by boiling; the same applies to grains like oats and barley, which develop antiscorbutic properties when allowed to sprout. On the other hand, Grijns has found that katjang-idjoe beans, when sprouted and boiled for one hour, lose their power of preventing experimental neuritis.

Casimir Funk referred to the antineuritic substance which he had isolated from rice polishings, and which was extraordinarily effective in curing paralytic symptoms in pigeons. The polishings are extracted with alcohol containing gaseous HCl, and the extract, after being freed from alcohol and fatty substances, is precipitated by phosphotungstic acid in acid solution; the precipitate contains the active substance, and from this

it is possible to separate off a small quantity of crystalline nitrate of a base having roughly the formula $C_{12}H_{18}O_4N$ (HNO_3).

Kerr reports an outbreak of beri-beri in Northern Siam among a population which lived on hard-husked rice, stored from the previous year's harvest. He gives no details as to the symptoms, &c., but the circumstance is so contrary to most of our other experiences of beri-beri, that it would be desirable to have very detailed facts concerning the outbreak.

W. S. H.

The Estimation of Arsenic in Organic Substances and Organic Arsenic Compounds.—For those interested in the estimation of the quantity of arsenic excreted from the body after the administration of salvarsan, atoxyl, soamin, &c., the method described by Paul Bohrisch and F. Kurschner (*Pharm. Zentr.*, H.52, 1911) is one thoroughly to be recommended. It is reliable, takes little time, and in the case of urine does not require a preliminary evaporation.

A determination of the arsenic in organic combination, which does not involve the usual laborious methods, while being at the same time sufficiently accurate, is naturally of considerable use to sanitary officers and clinical pathologists in the Service both at home and abroad.

Paul Jannasch and T. Seidel (*Berl. klin. Woch.*, No. 43, 1910) described a method for the quantitative volatilization of arsenic from solutions, whereby arsenic chloride can be reduced to arsenious chloride by hydrazine salts. They recommended the following method of analysis: The sample is washed into a special distilling flask with a little water and the addition of 80 to 100 c.c. of arsenic-free hydrochloric acid (sp. gr. = 1·19), 1 grm. of potassium bromide, or concentrated hydrobromic acid, and 3 grm. of hydrazine hydrochloride or sulphate. The flask is then connected with a condenser by means of a ground glass joint, to the end of which a 50 c.c. pipette is sealed on and allowed to dip into a receiver containing water. The contents of the flask are then distilled until the volume of the residue is from 25 to 30 c.c., which takes about an hour to complete. All the arsenic is volatilized in this one operation, and the amount may be determined either volumetrically or gravimetrically. They state that their method is accurate in the presence of antimony, copper, mercury, silver, lead, and phosphoric acid, which may afterwards be estimated in the residue.

W. Ney (*Pharm. Zeit.*, 1911, No. 15, 616) recommends that the substance containing arsenic, such as a portion of an animal organ, should be distilled with 100 c.c. of hydrochloric acid (sp. gr. 1.19), 2 grm. of potassium bromide, and 5 grm. of hydrazine sulphate, until the mixture has been reduced to a syrupy consistency. The distillate is received into 200 c.c. of water, and after neutralization and the addition of sodium hydrogen carbonate, titrated with iodine solution in the usual way.

Paul Bohrisch and F. Kurschner (*Pharm. Zentr.*, H.52, 1911) have still further improved the process, and state that it is inapplicable to metallic arsenic and arsenious sulphide, owing to their being incompletely converted into the chloride by hydrochloric acid, but that satisfactory results are obtained from atoxyl and salvarsan, or from milk and urine containing these compounds.

For estimating the amount of arsenic excreted in a sample of urine,

from 50 to 75 c.c. of the urine are distilled with 100 c.c. of arsenic-free fuming hydrochloric acid, 4 grm. of hydrazine sulphate, and 2 grm. of potassium bromide. The distillation is best carried out, without a condenser, by means of a 50 c.c. bulbed pipette connected with the flask and dipping into a receiver containing 100 c.c. of distilled water. The receiver is kept cool by a stream of running water directed on to the outside.

The distillation, which takes about one hour, should be carried almost to dryness.

The arsenic present comes over as the trichloride $AsCl_3$, and in the presence of sufficient water arsenious oxide is precipitated. The contents of the receiver are then cooled and neutralized with concentrated sodium hydroxide.

Three grammes of sodium hydrogen carbonate are added, with a few drops of starch solution and decinormal iodine run in until a permanent blue colour is produced.

One cubic centimetre of decinormal iodine solution represents 0·004911 grm. of pure arsenious oxide.

W. W. O. B.

Venom in Malignant Disease.—V. Dungern (*Berl. klin. Woch.*, February 12, 1912, p. 330) has succeeded in causing the disappearance of sarcomatous tumours of rats by means of injections of rattlesnake venom. He has also observed the effects of this endothelial toxin in some hopeless cases of human mammary cancer. Although cure did not result, yet the favourable action was so pronounced that further experiments seem justified.

C. B.

Antivenene and Adrenalin in Sarcoma.—H. G. and A. S. Grünbaum (*Lancet*, March 9, 1912, p. 644) state that they have cured large sarcomata of rats and mice in 70 per cent of thirty-four animals by the simultaneous injection of adrenalin and antivenom serum (Pasteur Institute), whereas in only 19 per cent of untreated animals the tumours underwent regression. One human inoperable recurring sarcoma has shown diminution in size and relief of symptoms under this treatment.

C. B.

Chemotherapy of Malignant Growths.—V. Wassermann, v. Hausemann and M. Wassermann (*Berl. klin. Woch., January* 1, 1912, p. 4) refer to the failure which has attended the treatment of cancer with the serum of animals which have been immunized with emulsions of malignant tissues. Some measure of success was attained by Reicher, who caused the disappearance of cancer in mice by injecting adrenalin into the periphery of the tumour. Wassermann and his collaborators, wishing to study the vitality of cancer cells in the serum of healthy and infected persons, recalled the researches of Gosio in 1905. He had found that the sodium salts of tellurium and selenium are reduced by living cells in which a red or black precipitate is deposited. They therefore examined tumours which had been treated with these salts, and observed that only the cancer cells became impregnated with the deposit. Remembering Ehrlich's dictum that substances do not act except where they are fixed, they asked themselves whether an affinity between the tellurium and selenium and

the malignant growth existed in the living body. They therefore injected watery solutions of these salts into the malignant tumours of mice, with the result that these disappeared in many instances. After this had been established, they endeavoured to suppress the cancerous growth by means of intravenous injections. The salts, however, proved to be highly poisonous, and non-lethal doses were without effect. The experimenters then searched for some substance which should guide, so to speak, the tellurium and selenium to the selected spot. They give the name cytotrochine (τροχια, path) to such an agent. v. Wassermann had shown fifteen years previously that dye-stuffs of the triphenylmethane group, e.g., fluorescine, had an affinity for certain tissues when their solutions were introduced into the veins. After experimenting with some two hundred combinations of these with selenium and tellurium they discovered an eosin-selenium preparation of a very perishable character which exerted a specific action on cancer of mice. If 2·5 mgm. were injected into a healthy mouse, the tissues throughout the body became bright red, whereas the same dose given intravenously to a cancerous mouse, was concentrated almost entirely in the new growth, leaving the rest of the body almost unchanged in colour. Microscopical examination showed that the selenium was deposited on the nucleus of the cancer cells in the form of very small black granules. It is probable, therefore, that it is the chromatin which reduces the selenium salts. After the third injection the tumour became softer, nuclear fragmentation, known as pyknosis, was apparent and the tissues disintegrated. Under subsequent doses liquefaction proceeded and absorption commenced, until, finally, in place of the swelling only an empty sac could be felt, and the animal recovered. No recurrence took place. In those mice the malignant growths of which exceeded a cherry in size, the amount of disintegrated material set free was so great as to cause their death. If the treatment was not sufficiently intensive to destroy all the cancer cells, relapses were frequent, usually within eight or fourteen days. These were not amenable to any further injections.

Selenium and tellurium are elements of the sulphur group. The former is obtained chiefly from iron pyrites, the latter is a rare substance which occurs as telluride of gold, silver and lead in Hungary and North America. Sodium selenate, Na_2SeO_4, exists as colourless crystals which contain water of crystalization like its homologue sodium sulphate, Na_2SO_4.

C. B.

The Growth of Tissues Outside the Body.—S. Hadda (*Berl. klin. Woch, January* 1, 1912, p. 11) states that Harrison was the first investigator who studied cell growth *in vitro*. He demonstrated proliferation of a frog's nerve-fibres mounted on a slide in a drop of lymph. Next Carre and Burrows were successful in cultivating the tissues of warm-blooded animals. Carrel's technique is based on absolute asepsis. All operations must be done in a dust-free chamber. He uses as a culture medium plasma which has been allowed to clot. To obtain this, he centrifuges blood, drawn directly from an artery into paraffin-coated tubes at 0° C. until the corpuscles are separated. He then decants the plasma and preserves it in paraffin-coated capsules in the ice-chest. It is very perishable. A fragment of living tissue, no larger than a pin-head, is

placed on a slide and is covered with a drop of plasma which rapidly clots. A cover slip is applied, and is sealed with paraffin. The temperature of the tissue must not be allowed to fall below 37° C. They have grown embryonic and mature tissues of dogs, cats, rats, pigeons and rabbits, malignant tumours of the lower animals, and human sarcoma and carcinoma. Lambert and Hanes have made use of this method in experimenting with the sarcomatous tumours of rats and mice. Between 70 and 90 per cent of their cultures were successful. Rous has shown that small wounds in fragments of skin of the frog or guinea-pig will heal *in vitro*. He found that the new cells which develop in cultures of malignant tumours of animals are infective.

Hadda learnt Carrel's methods, and has been carrying out his researches since April, 1911. Particles of embryonic tissues show signs of proliferation in a few hours. With adult tissues, two or three days must elapse before changes are visible. Granular processes spring from the fragment, which become thicker, branching and interlacing. Nuclei appear at the points of intersection, and round cells like leucocytes arise in the meshes. Gradually the processes assume the form of spindle cells. The maximum development of cultures of the pigeon's embryo is attained in two or three days. After five to eight days, clear, round dots appear in the cell, which quickly enlarge and seem to be a sign of fatty degeneration, for then the culture dies. Before this occurs, the culture may be successfully transplanted. The original morsel of tissue can undergo proliferation anew if placed in fresh plasma. Hadda has made 105 cultures of embryonic tissues of which seventy-three were successful, including those of skin, spleen, cartilage, choroid, kidney, heart, intestine and brain. The greatest proliferation was observed in the skin and spleen preparations, and the least in the brain. He has had eleven positive results in twenty-seven attempts to grow the organs of the adult rabbit. With human tissues he has had nothing but failure. He noted that growth of the animal tissues may be accelerated by mixing the animal's plasma with that of another species. Nevertheless a mixture of human and animal plasma did not permit a growth of human tissues.

C. B.

Measles in the Monkey.—Grünbaum succeeded in inducing measles in the chimpanzee. J. F. Anderson and J. Goldberger (*Public Health Reports*, June 9, 1911, p. 897) have experimented with *Macacus rhesus*. Out of nine of these monkeys which they inoculated with the blood of measles patients withdrawn from fourteen to thirty-two hours after the outbreak of the rash, four contracted the infection. After an incubation period of ten or eleven days the animals passed through a mild febrile attack, accompanied with a papular eruption which lasted four or five days. The passage of the virus from these to other apes has been successful in three out of five attempts. The blood of the measles patients was sterile in culture in the usual media.

Nicolle and Conseil (*Compt. rend. Acad. Sciences*, 1911, p. 1522) injected into an ape 6 c.c. of the blood which was abstracted from a child suffering from measles twenty-four hours before the appearance of the rash. The *M. sinicus* developed fever nine days later, which continued for six days.

C. B.

Infective Endocarditis.—Jochmann (*Berl. klin. Woch.*, March 4, 1912, p. 436) has examined by blood culture twenty-eight cases of infective endocarditis, also called septic, ulcerative or malignant endocarditis, and has found micro-organisms present. He has thus confirmed Kraus and Grawitz' observations. Lenhartz also had obtained positive results in thirty-seven blood tests. The infecting agents which occur most frequently are streptococci, next come staphylococci, then pneumococci, gonococci, *Bacillus coli communis*, meningococci and *B. pyocyaneus*. We may distinguish clinically between acute and chronic cases. In the former, after short prodromal symptoms, such as headache, pain in the limbs, lassitude and slight feverishness, a rigor occurs and the temperature suddenly rises. The patient soon has the appearance of profound illness. The spleen is enlarged and palpable. Hæmorrhages take place in the skin and retina. Under the advancing anæmia and heart failure he succumbs in a few days' time. Though no age is exempt, between 20 and 50 is the most usual epoch. The endocardial site of the infection is generally the mitral valve; rather less often the aortic orifice is implicated; more rarely the pulmonary and tricuspid valves are involved. The localization of the lesion as a rule can be determined by auscultation, though instances are not uncommon in which extensive endocarditis is found post mortem undetected during life through the absence of bruits. Valves which have been damaged by past endocarditis, or by arterio-sclerosis, are prone to be attacked by fresh infections. Nevertheless such puckered valves often escape, for infective endocarditis develops in only 20 per cent of the cases in which bacteria invade the blood-stream.

Two varieties of streptococci give rise to endocarditis. (1) *S. hæmolyticus*, which has the power of laking blood; and (2) *S. viridans* (Schottmüller) which grows in more delicate colonies on blood agar, of a greenish tint, without hæmolytic properties. The former causes an illness accompanied by repeated rigors and high fever, fatal in a few days, while it is to the latter microbe that most instances of chronic infective endocarditis are due. Jochmann has met with seven of these chronic cases. The onset has been insidious, there have been indefinite aches in the joints and limbs without any local cause, malaise, pyrexia, acceleration of the pulse and respiration, slight cough, suggesting influenza or early tubercle, since the sufferer looks pale and ill. Murmurs may now become audible in the mitral or aortic areas. The fever continues, the spleen is enlarged and is painful on palpation. The hæmoglobin is lessened and the leucoctyes are increased. The skin is somewhat jaundiced. Embolic infarcts of the brain, spleen and kidneys may occur. Moreover, aneurysms on the cerebral vessels may arise from streptococcic foci on their intima, hence hemiplegic attacks and meningitis are not rare. Hæmaturia and acute nephritis are frequent. Purulent pericarditis is not uncommon. The temperature ranges from 100° to 102° F., though it may remain between normal limits for periods of several days. When joint pains occur they are without objective signs and are uninfluenced by salicylates. The disease may run on for months, e.g., eight or ten, and has a high mortality.

The chief characteristic of staphylococcic endocarditis is the tendency to the formation of pyæmic abscesses in the lungs, kidneys and muscles, and suppurations in the joints and pericardium. The pyrexia is usually

high and continued. · Rigors are comparatively rare in spite of the numerous metastases. The prognosis is unfavourable.

Pneumococcic endocarditis is rare. Pneumococci are present in the blood in about 70 per cent of cases of pneumonia. They infect the cardiac valves in less than 1 per cent. After the crisis the patient may remain comparatively well for some days, when his temperature ascends and becomes irregular. Remissions of 3° to 4° F. are not infrequent. Purulent meningitis is often noted which may cause stiffness of the neck, Kernig's sign, paralysis of the cranial nerves, optic neuritis, delirium and coma. Large effusions into the joints may ensue. These cases uniformly end in death.

In gonococcic endocarditis the prognosis is somewhat better. The temperature is often intermittent. The pericardium and myocardium are sometimes involved. Collargol has proved useless in infective endocarditis. Vaccine therapy offers some slight hope. Alcohol should be forbidden on account of the tendency to heart failure and embolism.

C. B.

Sandfly Fever in Catania.—Giunta (*Münch. med. Woch.*, February 12, 1912, p. 2682) reports an outbreak of sixty-two cases of sandfly fever which occurred in a convent in Catania, Sicily, during the months of May and June, 1911. No malarial parasites were discovered in the blood. The *Phlebotomus papatasii* was captured in considerable numbers in the sleeping apartments. C. B.

Detection of Blood in Fæces.—Zoeppritz (*Münch. med. Woch.*, January 23, 1912, p. 1807) recommends the following method for the detection of traces of blood in the intestinal contents. Three to fifteen c.c. of the fæces, reduced to semi-fluid consistence by the addition of water, are stirred with $\frac{1}{3}$ to $\frac{1}{2}$ the volume of glacial acetic acid. The solids are allowed to fall to the bottom and the liquid portion is decanted, and is mixed with 3 to 5 c.c. of ether. Should the mixture be agitated too violently a turbid emulsion results, which may, however, be cleared by adding a few drops of alcohol. If the ether and the watery dilution of the fæces do not separate readily this may be effected by the addition of more water. The ether extract is next poured off, and after washing with water, is put into a test-tube into which a small quantity of finely-powdered guaiacum resin has been introduced. This is then trickled on a filter-paper which has been moistened with mature turpentine. A blue tint appears along the edges of the meeting of the fluid with the paper in from one to sixty seconds if blood be present. Any colour which may arise after this interval must be disregarded.

C. B.

Frequency of Duodenal Ulcer.—Simmonds (*Berl. klin. Woch.*, February 12, 1912, p. 328) has ascertained that in 15,000 post-mortem examinations duodenal ulcers were found thirty-six times and their scars seven times. Gastric ulcers and their cicatrices were ten times as frequent. In 40 per cent of the duodenal ulcers that condition was the cause of death. The greater frequency of scars of stomach ulcers com-

pared with duodenal scars indicates the smaller tendency of duodenal ulcers to heal. Only one-quarter of the ulcers occurred in women and one-sixth in children. No relation between burns and ulceration in the duodenum was noted. He draws attention to the fact that hæmatemesis may be caused by varicosity of the veins of the cardiac end of the stomach, and that cancer of the stomach may remain without symptoms for long periods.

C. B.

A New Method of Immunization against Trypanosome Diseases.—Professor Schilling (*Deut. med. Woch.*, No. 1, 1912) has published an account of some interesting work on this subject. His procedure was as follows:—

Rats, heavily infected with the trypanosome of nagana were bled into bouillon containing 2 per cent of sodium citrate; the mixture was then centrifuged, and the upper turbid layer drawn off by a pipette and mixed with an equal quantity of bouillon in which tartarated antimony, 1 in 700, had been previously dissolved. The fluid was again centifuged, the sediment mixed with a small quantity of boullion and allowed to stand for at least two hours. One-half to two cubic centimetres of the resultant fluid injected into the peritoneal cavity of a rat produced in the course of twenty-four hours a distinct immunity against trypanosome infection.

C. E. P.

Observations on the Effect of Various Drugs in Expelling Hook-worm.—Burton Nicol (*Journ. Trop. Med. Hygiene*, January 1, 1912) has published an interesting account of some observations on the action of various drugs on the hook-worm.

His conclusions are as follows:—

"The effect of the various drugs employed may be best demonstrated by a table showing the percentage of parasites expelled by the first and subsequent treatments.

PROPORTION OF HOOK-WORMS EXPELLED.

	First treatment per cent	Second treatment per cent	Third treatment per cent	Fourth treatment per cent	Fifth treatment per cent
Thymol (90 gr.)	97·87	2·13	0·0	—	—
Eucalyptus (2·5 gr.)	74·2	7·2	17·0	1·13	0·37
Izal (4 drm.)	90·0	10·0	0·0	—	—
Beta-naphthol (60 gr.)	86·0	14·0	0·0	—	—
,, (90 gr.)	97·32	1·58	0·89	—	—
Pelletierine tannate (12 gr.)	0·0	0·0	—	—	—

"Thymol and beta-naphthol gave much better results than any of the other drugs. There is probably very little difference between them in anthelmintic power, but the constitutional disturbance caused by thymol is so great that it cannot, in these doses, be used on a large scale. Beta-naphthol causes comparatively little disturbance, is effective, easily administered, and costs much less than thymol."

Venereal Prophylaxis.—Neisser and Siebert introduced a fat-free cream for the prevention of venereal disease two years ago. Sklepinski (*Deut. med. Woch.*, April 4, 1912, p. 656) has remedied a defect in its

composition by increasing the amount of glycerine and decreasing that of alcohol. His prescription is as follows :—

Tragacanth. (powdered)	2	parts
Glycerine	27	,,
Mix and add—		
Sodium chloride	1	part
Starch (powdered)	4	parts
Gelatine	0·7	part
Water	50	parts
dissolved by heat.		
Then thoroughly incorporate—		
Corrosive sublimate	0·3	part
dissolved in alcohol	15	parts

C. B.

The Abortive Treatment of Syphilis.—K. Stern (*Münch. med. Woch.*, February 13, 1912, p. 348) has treated fourteen cases of primary syphilis with salvarsan. No secondary symptoms appeared except in one instance in which roseola was observed three months after a third intravenous injection of 0·4 grm. of "606" In eight the Wassermann reaction was negative before and after treatment. In the remaining six an originally positive reaction was changed to negative, though in three of these it again became positive. Patients must be kept under observation for more than six months before deciding whether they are cured.

Queyrat (*Berlin. klin. Woch.*, March 3, 1912, p. 483) reports the results of the administration of salvarsan in seventy-eight initial lesions. In fifty-one no secondaries appeared, and the Wassermann reaction remained negative. In sixteen the serum reaction became positive, though no symptoms arose. In eleven, syphilides and a positive blood response were noted. He thinks that salvarsan is capable of destroying all the treponemata if injected within fourteen days of the date of infection, though this cannot be affirmed in the later stages of the infection.

C. B.

Salvarsan in Malaria.—Tuschinsky (*Deut. med. Woch.*, March 21, 1912, p. 548) has given 0·5 grm. of salvarsan intravenously in thirty-six cases of tertian, in four of quartan, and in thirty of æstivo-autumnal malaria. The attacks of benign tertian ague were aborted. The plasmodia disappeared from the blood in twelve or twenty-four hours. The spleen became smaller. The dose of 0·5 grm. was repeated in ten days. Notwithstanding this, recurrences were observed in one-sixth of the patients treated, at intervals of from fifteen to eighty-five days.

If the dose of salvarsan were smaller, there was some evidence that the parasites became resistant to arsenic. The patients who suffered from the quartan and æstivo-autumnal infections were not benefited by the remedy.

C. B.

Russian Army Medical Service.—The following notes have been extracted from an article (*Militär. Wochenblatt*, No 7, 1912) reviewing the reorganization of the Russian Army :—

Some important reforms have recently been made in the Army Medical Service. Formerly the District Medical Inspector administered the medical service with the troops while the military hospitals were

under the control of a Hospital Inspector, who was a non-medical staff officer. The latter appointment has now been abolished and the whole of the medical services placed under the District Medical Inspector.

C. E. P.

Catgut prepared with Tincture of Iodine.—Stabsarzt Professor Dr. Hoffman and Stabsapotheker Budde (*Deut. med. Woch.*, No. 13, 1912) reported the results of some investigations as to the effect of tincture of iodine on catgut. Their conclusions are as follows :—

(1) Catgut can be as thoroughly sterilized in 5 per cent alcoholic tincture of iodine as in a 1 per cent watery solution of iodine.

(2) The tensile strength of the catgut is not reduced by soaking it for five days in 5 per cent tincture of iodine provided the catgut is tightly wound on a frame. Catgut placed loose in the tincture becomes untwisted and loses 50 per cent of its tensile strength.

(3) The action of tincture of iodine on catgut results in the formation of hydriodic acid in the fibres of the gut. Tincture of iodine which has been used once for the preparation of catgut always contains a considerable percentage of hydriodic acid which is readily taken up by the albuminous constituents of the gut. Therefore only freshly prepared tincture should be used.

(4) Catgut sterilized by dry heat and placed loosely for thirty minutes in 10 per cent alcoholic tincture of iodine to which 3·5 per cent of potassium iodide has been added, does not take up so much iodine and is therefore more easily absorbed in the body.

C. E. P.

Mechanical Asepsis in the Treatment of Wounds.—Dr. W. v. Oettingen (*Deut. Militärärzt. Zeit.*, No. 6, 1912) published a paper on his "Mastisol" treatment of wounds in peace and war (see JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, January, 1912, p. 119). During the battle of Mukden, v. Oettingen treated over 1,000 wounds by this method, and the results were so good that he was induced to perfect the method on his return to Germany. Mastisol fixes the bacteria in the skin and prevents them from reaching the wound. It has the further advantage of securely fixing the dressing in position thus eliminating all need for bandaging. No preliminary shaving or washing is required. It is obvious therefore that in dressing wounds in the field the mastisol method effects a great saving in time and material.

v. Oettingen uses sterilized twill for covering the wound. Twill permits evaporation and oozing to take place through its substance, at the same time it is strong and can be used to draw the skin together and so reduce tension on the stitches; this is especially useful after laparotomy, as the patient need not be lifted to have a circular bandage applied. The dressing can be easily removed by rolling it off the skin but not by a direct pull. v. Oettingen dips all his sutures into mastisol; bacteria will not grow along material treated in this way.

The mastisol dressing of wounds does not require any water; in field surgery this is an immense advantage.

C. E. P.

Extensive Food Poisoning in Barracks.—Stabsarzt Dr. Bofinger (*Deut. Militarärzt. Zeit.*, February 20, 1912) reported the following occurrence: From September 2 to 4, 1911, 186 men belonging to the

six companies of infantry in the Moltke Barracks, Stuttgart, reported sick with the following symptoms: headache, abdominal pains, diarrhœa and a temperature of 102° to 104° F.; about a quarter of the patients suffered from severe attacks of vomiting; in most cases the tongue was furred and the abdomen swollen and tender. The illness lasted about four days.

In fifty of the cases the stools were examined bacteriologically and the *Bacillus enteritidis* of Gaertner recovered. The patients' serum also agglutinated this bacillus in high dilutions. An important point in regard to the isolation of these cases is that bacilli were still plentiful in the stools up to the ninth day and only disappeared on the twelfth day.

Origin of the Outbreak.—An inquiry as to dates of onset pointed to the infection having taken place on September 1. Further inquiry suggested that the meat served at dinner that day was the infecting agent. Naturally no sample of this could be obtained. It was found, however, that three persons employed in the kitchen had suffered from diarrhœa on September 1. Gaertner's bacillus was recovered from the stools of one of them and the serum of all three persons agglutinated the bacillus in high dilutions. On September 1, the six companies had been out on field training and did not get dinner till four hours later than the usual time. The meat was cooked at the usual time and cut up for serving. It was then kept warm for four hours awaiting the return of the men. In all probability the cooks infected the meat when cutting it up. During the four hours waiting the bacilli multiplied rapidly and were consequently able to produce the attacks of poisoning. Experiments were made to test the effects of four hours' incubation on pieces of cooked meat, artificially infected with minute quantities of Gaertner's bacillus; the experiments showed that in this condition an enormous increase of the bacilli takes place. None of the men who received their dinner at the usual time showed any signs of poisoning.

C. E. P.

To Measure the Hardness of X-ray Tubes.—Assistant-Surgeon Dr. Broese (*Deut. Militärarzt. Zeit.*, No 5, March 5, 1912) describes a simple apparatus which he has constructed for measuring the penetration of X-rays. It is made by taking a sheet of aluminium 4 mm. thick and cutting it into strips. One strip is hammered so as to reduce its thickness to 2 mm. The pieces of aluminium are then fastened on to a board to form a series of steps. The first step has a thickness of 2 mm. the next of 4 mm., the next of 6 mm. and the last 8 mm. In the centre of each a small strip of lead 2 mm. thick is fastened. Along one side of the scale a broad strip of lead 2 mm. thick is attached. No rays penetrate the lead, this therefore affords a standard for comparison as to the number of millimetres of aluminium which the rays can penetrate. The scale is empirical, but in the hands of the same worker it gives useful results.

C. E. P.

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Original Communications.

NOTE ON A BACILLUS OCCURRING IN SOME INTRACTABLE VENEREAL ULCERS.

BY LIEUTENANT C. H. H. HAROLD.
Royal Army Medical Corps.

AMONGST ulcerative venereal diseases not the least important is the condition known as soft chancre, a term applied to numbers of non-syphilitic lesions which are usually attributed to infection with Ducrey's bacillus. Clinically these cases present great differences, and it is questionable whether in some of them at any rate another organism is not the chief factor in their causation. Cases of this type of disease may be divided into two main groups.

Group (1)—Soft ulcers which remain in a callous condition for a few weeks and may give rise to a bubo requiring operative treatment. Surgical measures as a rule are quite sufficient to cause healing of these cases in a comparatively short time.

Group (2)—A more eroding type of ulceration, with which this paper is more intimately connected; this form is much more resistant to treatment, spreading in spite of every conceivable surgical procedure, and may destroy considerable portions of the external genitalia. The base of the ulcer is usually soft and covered with greyish granulations which secrete a viscid glutinous pus with a characteristic odour, while its cleanly cut and slightly undermined edges show no signs of reaction. These ulcers frequently cause inflammatory buboes which require

operative interference and the resulting wound exhibits the same ulcerative characteristics as those of the primary ulcer. Some buboes also which depend upon soft chancres of a simpler type than the one just described may take on this character after being opened.

This second type of ulcer is important because of its unsatisfactory response to treatment. The patient remains in hospital for many weeks or even months, being not only inefficient but causing the expenditure of considerable time and energy on the part of his medical attendants.

On account of the unsatisfactory results of purely surgical treatment it was decided to investigate the bacteriological nature of these lesions with a view to vaccine treatment. The following cases in which this was done will illustrate the value of this procedure.

A patient under the care of Major C. W. Profeit, R.A.M.C., was suffering from a slow phagedænic ulceration of the penis clinically resembling the second group of cases just described. Two-thirds of the glans penis had ulcerated away and the remaining third was attached by a small ulcerated pedicle. The ulcer also extended the whole way around the body of the penis and following the course of the urethra had penetrated for some distance into the corpus. The passage of urine irritated the ulcer and gave rise to much pain and scalding. He was also suffering from syphilis contracted at the same time. In another hospital, treatment which included three operations and vigorous anti-syphilitic measures had been carried out for seven months, but had been unsuccessful in arresting the destruction of tissue. After transfer to Rochester Row, he had been treated with salvarsan and mercury and clinically showed no signs of syphilis, while his blood for the last three months had given a negative Wassermann reaction. In spite of all this medical and surgical treatment, however, the ulceration was becoming progressively worse, and as a last resource amputation of the penis was advised; to this the patient cheerfully agreed:—

Before doing this Major Profeit suggested that it might be of interest to make a complete bacteriological investigation of the ulcer with a view to vaccine treatment. The edge of the ulcer was scraped and some of the exuded serum examined by the dark ground illumination, but no spirochætes of any description were discoverable. Some of the exuded serum was sown on several tubes of human serum agar and two kinds of organisms were

recovered from them: (1) a *Staphylococcus aureus;* (2) a short bacillus. A carbolized vaccine prepared from the bacillus was injected into the patient with rather astonishing results.

On the same evening the penis became so swollen and painful that the man was unable to sleep, and on the following day the base and edges of the ulcer had assumed a bright red colour, contrasting with their previous pale appearance, while the dressing showed an increased exudation of pus. There was also a large red tender swelling at the site of inoculation.

From this day onwards the ulceration improved and commenced to heal. The vaccine was repeated after four days and was followed by a reaction of the same type, but not so severe as after the first injection. Repeated doses of vaccine were subsequently given at four-day intervals and within a month the whole of the ulceration had healed with the exception of a small ulcer on the glans penis. The healing of this was probably delayed because the scar tissue at the base of the glans interfered with its blood supply. The patient refused to have this small portion removed, having made such rapid progress under vaccine treatment, and the small ulcer, a few millimetres broad, delayed his discharge from hospital for another month.

A few days after commencing the treatment of this case with vaccine the ulcer was again scraped and tubes inoculated with exuded serum. The same bacillus was recovered, but this time in pure culture.

My next patient was suffering from a chronic ulcerating bubo; he had been in hospital for sixteen weeks and showed no signs of improvement. Following the same method of procedure as in the previous case, the ulcer was scraped and the same organism recovered associated with a diplococcus. The same vaccine was administered and a marked reaction followed. On the night of the injection the man complained of severe pain in his thigh and was unable to sleep. The next day the whole of the groin was swollen and the bubo of a bright red colour, discharging increased quantities of pus; a large localized, red, tender swelling had also formed at the site of inoculation. Similar reactive signs, but of less severe character, occurred after each successive injection of vaccine; the man was discharged cured in less than a month from the time of commencing the vaccine treatment.

The next case clinically resembled the previous one. The patient had been in hospital for six weeks and the ulcerating bubo remained in a callous condition. The same bacillus and the

S. aureus were isolated and injections of vaccine caused the usual reactive signs in the patient, who was discharged cured in five weeks from the time of commencing the treatment.

The last patient was also suffering from an ulcerating bubo which had kept him in hospital for four weeks and bacteriological examination revealed the same organism associated with a *S. albus*. He gave the usual response to vaccine and the bubo is now rapidly healing up. Owing to my unavoidable absence from hospital the patient received one dose of vaccine instead of three in sixteen days, and during that time the bubo showed no signs of improvement.

These cases have all been treated by a vaccine made from the bacillus isolated from the first patient and grown on agar. The vaccine was sterilized by the addition of 0·5 per cent carbolic acid. The initial dose was 15 millions and this was increased gradually to 2,000 millions, the intervals between injections being four days. These have all caused marked local reactions both in the site of infection and in the site of inoculation. They were followed by little or no constitutional disturbance, the temperature of the patient rarely rising more than a degree. When for some reason the injections were withheld, or were not strong enough, the lesions lapsed to the previous callous condition. On these occasions the administration of stronger or more frequent doses of vaccine always produced a beneficial effect.

In none of the cases from which I have recovered this bacillus have I been able to find any organism corresponding to Ducrey's bacillus. The local reaction at the site of the ulcer and the marked benefit which was obvious from the commencement of vaccine treatment are strong evidence that the bacillus in question was the chief ætiological factor in the production of the disease.

Morphologically, it is a short rod-shaped organism 2·5 to 3 μ long and about 0·3 μ broad. In film preparations it is frequently seen lying in parallel rows, giving one the impression of a short palisade. It stains readily with any of the basic aniline dyes and is Gram positive. With all stains, but especially with carbol thionin, it shows marked bi-polar staining with a clear interval between the granules. These can also be demonstrated in many individual bacilli with Neisser's stain. It does not form chains, nor spores. Involution forms are frequent in cultures a few days old, the most frequent variety of these being swollen elongated forms which show no polar staining. Another form frequently seen is somewhat clubbed at one end, which is occupied by a large polar granule.

The organism is strictly aerobic, growing very luxuriantly on human serum agar as well as on 2 per cent agar (+ 6 Eyre's scale). After twelve hours incubation at 37° C., the colonies are the size of a pin's head, moist and heaped up in the centre. By reflected light they appear greyish white and with transmitted light they show a yellow centre with a lighter, well-defined margin. On microscopical examination with the low power they are finely granular with a sharply defined evenly circular margin. The colonies tend to remain discrete; in four days they attain a diameter of 3 mm. and their centres become a deeper yellow colour.

Grown on human serum it forms a grey white deposit and flocculi which sink to the bottom.

It does not liquefy *gelatine;* it grows on neutral red agar, but causes no change in the medium.

In peptone salt solution no indol is formed, while litmus milk is bleached by its action.

It ferments glucose and cane sugar, forming acid but no gas.

In lactose, maltose, dulcite, raffinose, inulin, and salicin no change is produced.

It is non-pathogenic to rabbits when injected into the bloodstream and only causes a local infiltrate when injected beneath the skin of the animal's ear.

In the "Bacteriology of Diphtheria," by Nuttall and Graham Smith, G. S. Graham Smith has collected the observations of numerous workers on the recovery of diphtheroids from the male and female genital tract. The chief varieties with their essential points of difference or similarity are as follows:—

Neisser (1888) recovered from the female vagina diphtheroids which were motile.

Berghy (1898) isolated from the urine and vaginal discharges of certain cases a Gram-positive diphtheroid which differed from the present one by forming a yellow growth on agar, by not liquefying gelatine and by forming a white membrane on broth. It was non-pathogenic to guinea-pigs and did not form acid in glucose.

Foulerton and Bonney (1903) recovered from two cases of puerperal septicæmia and from a case of phagedæna of the penis a Gram positive diphtheroid which showed no granules when stained with Neisser. Stroke cultures had the appearance of ground glass, and when grown in broth it appeared as an evenly staining rod. It did not ferment glucose and was non-pathogenic to guinea-pigs.

Pfeiffer in 1903 isolated Gram negative diphtheroids from normal men and from cases of gonorrhœa.

Graham Smith, Hallé, and Robertson and McRae have also recovered diphtheroids of a more diverse character.

On referring to the original literature I cannot find evidence that any test to prove the pathogenicity of these organisms to man was carried out, or that vaccines prepared from them exercised any therapeutic effect.

In conclusion, I wish to thank Major C. W. Profeit, R.A.M.C., for bringing these cases to my notice, and Major L. W. Harrison, R.A.M.C., for conducting the animal inoculations, and for his valuable technical suggestions.

Note.—Since writing the above my attention has been drawn to an article by Herbst and Gatewood, of Chicago, in the *Journal of the American Medical Association* for January 20, 1912. These workers made a bacteriological examination of a series of twenty-six soft sores, and recovered diphtheroid bacilli from sixteen of them, while a doubtful Ducrey's bacillus was found on two occasions only. A vaccine prepared from the supposed Ducrey's bacillus was administered to several patients, but with very poor results. One of the patients became steadily worse and was eventually treated with vaccine prepared from a diphtheroid bacillus and a staphylococcus isolated from the lesion. The result was excellent and subsequently other cases were treated with the same vaccine whenever an autogenous vaccine could not be prepared.

This vaccine gave rise to reactions which were exactly similar to those which I have described in my cases, but the authors do not state quite clearly in how many of the cases beneficial results followed its administration. Altogether they treated thirty-eight cases, of which thirty-nine per cent were benefited by vaccine treatment, but some of the thirty-eight were treated only with the vaccine prepared from the supposed Ducrey's bacillus. They believe, however, that if the diphtheroid or an autogenous vaccine had been used throughout the series the results would have been much better.

Guinea-pigs inoculated with a diphtheroid bacillus isolated from one of the cases developed local infiltrates; on one occasion the axillary glands became enlarged, and on another an ulcerating lesion formed at the site of inoculation from which the same organism was recovered.

They conclude that the diphtheroid bacilli isolated were the

cause of the soft sores in these cases, although organisms which are morphologically identical are commonly present in the urinary tract. They have not, however, detailed the morphological and cultural characteristics of the several organisms they isolated, so that it is impossible to identify any of them with the bacillus isolated at Rochester Row.

It seems probable, however, that the diphtheroid organism from which these workers prepared their vaccine is identical with the one which I isolated. Their methods of isolation, which were similar to mine, demonstrated the persistent presence of a diphtheroid, and the response to vaccine prepared from this micro-organism was the same as in my cases.

Their observations fully confirm those which I have independently made in indicating that soft chancres are not always caused by Ducrey's bacillus, and that the additional work expended in making a bacteriological examination of these cases with a view to vaccine treatment is amply repaid.

FURTHER EXPERIMENTAL INVESTIGATION INTO SUDAN KALA-AZAR.

By Captain W. E. MARSHALL.
Royal Army Medical Corps.

In previous communications on Sudan kala-azar it has been shown that this form of Leishmaniasis has the following characteristics:—

(1) It affects people of all ages, but is much commoner in late childhood and early adult life.

(2) The *Cercopithecus sabæus*, the ordinary grey monkey of the Sudan, can be infected with the disease by intraperitoneal or subcutaneous injection of the parasite.

(3) The parasite grows readily on 10 per cent citrate, on Novy and MacNeal's medium and on Nicolle's medium.

(4) The parasite can be demonstrated in the peripheral blood of the infected in a large percentage of the cases.

In the study of the method of transmission of infantile Leishmaniasis considerable progress has been made. The similar geographical distribution of canine and human Leishmaniasis and the occurrence of human cases in close contact with canine cases made it extremely probable that infection was conveyed from dog to child. There is now considerable experimental evidence in support of this theory, the probable transmitter being the *Ctenocephalus canis*, the dog-flea. Basile was successful in transmitting the disease from infected to uninfected pups, and was also able to infect pups with fleas brought from an infected district. The parasite has also been demonstrated in the interior of fleas by Basile, Sangiorgi, and Alvarez and Da Silva. Basile, La Cava and Visentini have found them also in *Pulex irritans*, the human flea. Franchini and Gabbi, on the other hand, have failed to find any intracorporeal development in the body of the flea. In support of the dog-flea theory it may be mentioned that the Sergents, Lombard, and Quilichini have recently found an infected kitten living in the house containing an infected child and an infected dog.

Present Investigation.

The following experiments are a continuation of the work already published with regard to the clinical features of the disease. There is little to add, but it is necessary to modify the statement

that the parasite is always present in the peripheral blood in small numbers, as two cases were seen where the parasites were present in considerable numbers. In one case, shown in the plate, there were two mononuclear cells in one slide, one containing thirty-two parasites and the other twenty-nine. This was early in the course of the disease. In the other case the parasites were extremely numerous, but were more uniformly distributed among the white blood-cells, the majority being inside polynuclear cells. This was from a case in the advanced stages of the disease.

The diminution or absence of eosinophile cells from the peripheral blood is usually well marked, and is of some help in differentiating kala-azar from malarial infections where usually a slight eosinophilia exists.

No drug has been found which in any way affects the course of the disease, and all cases seen since our last report have terminated fatally; "606" was tried in one case, but without any benefit.

Experimental Kala-azar in the Dog.

Our previous inoculation experiments with dogs were inconclusive, as with one exception all the dogs died soon after inoculation. We have therefore again inoculated four dogs with the parasites and in each case a positive infection was obtained.

Dog 1, ♂, injected intraperitoneally with post-mortem spleen emulsion from infected monkey.

82nd day: Liver puncture positive.

145th day: Chloroformed, infected with Leishmania.

Dog 2, ♂, pup, injected intraperitoneally; material obtained by post-mortem spleen puncture from a human case.

Died on 128th day; heavily infected with Leishmania.

Dog 3, ♂, pup, injected intraperitoneally with post-mortem spleen emulsion from Dog 1.

Died on 95th day; infected with Leishmania.

Dog 4, ♂, pup, injected intraperitoneally with material obtained by spleen puncture from a human case.

Died on 74th day; heavily infected with Leishmania.

There is therefore no doubt that dogs are susceptible to Sudan kala-azar. They can be infected from the monkey, from another infected dog, or from human cases. Young dogs are more susceptible, and in them the disease runs a more acute course. Dog 1, which was an adult, showed very few symptoms, and was in fairly good condition on the 145th day when it was chloroformed. As in the monkey, probably the best way of producing an infection is from

a spleen puncture of a human case during life. Dog 4 was inoculated in this way, and died with a severe infection on the 74th day.

Owing to Basile's discoveries it was decided to try to convey the disease from dog to dog by means of fleas, the *Ctenocephalus canis* being used.

Dog 5, ♂, was put in the room beside Dog 1 after the latter was known to be infected. The dogs were in contact for thirty-seven days, and fleas were frequently placed in the room and were constantly present on both dogs. No infection occurred. This dog was chloroformed five months later, when no parasites were found on post-mortem examination.

Dog 6, ♀, pup, was put in the box beside Dog 2, four days after the latter had been inoculated. They were together for 124 days and fleas were frequently placed in the box. No infection occurred. This dog was chloroformed two months later; the post-mortem examination showed filaria, but no Leishman-Donovan parasites.

So far, therefore, we have been unable to convey infection from dog to dog by means of the flea. It must be borne in mind, however, that these experiments were carried out in the summer, when human cases are less frequent, and when the temperature is probably less favourable for infection.

A similar experiment was carried out to determine if ticks could convey the disease from dog to dog.

Dog 7, ♂, pup, was put in box beside Dog 3, when the latter was inoculated. The dogs were 95 days in contact. Ticks were introduced at frequent intervals. No infection occurred in Dog 7.

Experimental Kala-azar in the Grey Monkey (*Cercopithecus sabæus*).

Further experiments were carried out to endeavour to determine by what means the disease may be conveyed from monkey to monkey.

In one experiment an infected and a healthy monkey were freed from all insects and were kept together in a wire-gauze cage. They were fifty-four days in contact. No infection occurred in the healthy monkey.

In a second experiment similar precautions were taken, but monkey fleas were placed in the cage. Unfortunately the infected monkey died twelve days later, so they were only a short time in contact. No infection occurred in the healthy monkey.

In a third experiment an infected and a healthy monkey were

freed from all insects and kept in an open cage. They were seventy-one days in contact. No infection occurred in the healthy monkey.

In a fourth experiment no precautions were taken to render the monkeys free from insects, and one infected and two healthy monkeys were put together in an open cage. There was a doubtful infection of one healthy monkey, but the slides were unsatisfactory, the post-mortem examination being made some time after death.

In a fifth experiment, similar to the fourth, no infection occurred in the healthy monkeys.

In a sixth experiment numerous lice (*Pediculus capitis*) were fed at intervals on a human case and then transferred to a healthy monkey. No infection occurred.

These results are therefore all negative, with the possible exception of one monkey in Experiment 4. In that experiment lice were the only insects actually found. [The monkey louse (*Pedicinus*) is quite different from the human species, having a very elongated head and only three instead of five joints to the antennæ.] In this experiment also the infected monkey was removed from the cage for a time in order to see if the *Ctenocephalus canis*, the dog-flea, would infect the monkey, though with apparently negative results. As the cage was an open one mosquitoes also were not excluded, so that even if this monkey were infected, the louse, the flea, and the mosquito are all possible carriers of infection.

In the autumn many of the monkeys suffered from the plasmodium of monkey malaria, and we lost many animals.

Though one can, in the majority of cases, be sure of infecting monkeys, we had one animal which showed a natural immunity from infection. It was injected intraperitoneally from spleen puncture of a human case, but no infection occurred. Six months later it was again inoculated intraperitoneally with a spleen emulsion from Dog 1, and again no infection took place. Another monkey inoculated with the same splenic emulsion contracted the disease. Perhaps, as Delanoë has recently shown occurs with cultures of Leishmania, the immunity is purely phagocytic.

Conclusions.

(1) Dogs can be experimentally infected with Sudan kala-azar.

(2) They can be infected from human cases, from infected monkeys, or from other infected dogs.

(3) Young dogs are more susceptible, and in them the disease runs a more acute course.

(4) Experiments to transmit the disease from dog to dog by means of the *Ctenocephalus canis*, the dog-flea, gave negative results.

(5) The Leishman-Donovan parasite is occasionally present in large numbers in the peripheral blood of human cases.

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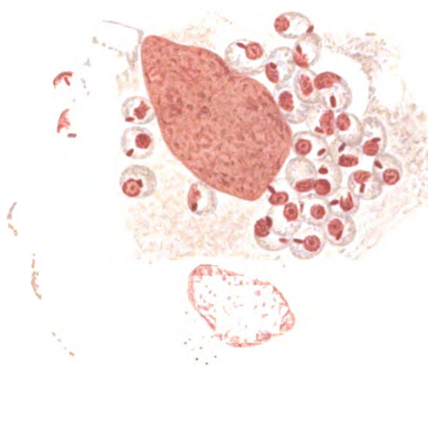
Drawings.—Fig. 1. Large mononuclear cell from peripheral blood, case of kala-azar; it contains thirty-two parasites. × 1,500. Giemsa's stain.

Fig. 2. Cell from same slide, containing 29 parasites. × 1,500. Giemsa's stain.



MODIFICATIONS OF WASSERMANN'S REACTION.

By Lieutenant-Colonel C. BIRT.
Royal Army Medical Corps.

The value of the information which the Wassermann reaction affords is so great that the test should be available in every hospital.

The following cases, which have been seen at the Royal Military Infirmary, Dublin, between the end of the year 1910 and the beginning of 1912, show that without the guidance of the serum reaction, treatment would have been inappropriate, diagnosis would have been haphazard, prognosis mistaken, and the claims of the patient against the public would have been wrongly assessed.

A married non-commissioned officer alleged that his arm had been injured through a fall from his horse while on duty. There was a firm swelling which involved and partially paralysed the biceps and deltoid. The X-ray examination was negative. The delay which occurred in the subsidence of this tumour threw doubt on its being a hæmatoma. A blood test gave the clue. Captain A. T. Frost administered salvarsan. This patient's rapid recovery was reported in the Journal of the Royal Army Medical Corps of April last.

An officer, who was suffering from a chronic pustular eruption of his scalp attributed to Indian service, was sent to the Royal Infirmary for vaccine treatment. A positive serum reaction indicated the suitable remedies.

An officer appeared before a Medical Board at the expiration of sick leave, which had been granted on account of slight mental abnormality. The Board was impressed with the gravity of his condition by reason of a positive Wassermann test. Signs of general paralysis of the insane, which were not then evident, are now present.

Syphilitic fever is uncommon, and easily escapes detection. Three cases remained under observation for enteric fever during considerable periods, until the true nature of the infection was discovered by means of a positive Wassermann reaction.

Medical Boards often experience difficulty in deciding whether a soldier's disability has been caused by military service, especially in those heart cases which are not of rheumatic origin. Two non-commissioned officers were discharged on account of aortic disease. In both the blood test indicated that syphilis was the cause.

We are frequently called upon to report on ex-soldiers who have

developed some disability which they assert has originated in military service. In three instances skin gummata were said to be the sequels of gunshot wounds. Hemiplegia has been found to be of specific origin, and not due to sunstroke. A plausible soldier was invalided from India in consequence of tabes; a kindly disposed officer listened to his tale, and altered the name of the disease to neuritis. A positive serum test, however, would seem to make it clear that the original diagnosis was correct.

On the other hand a negative response has often prevented injustice being done. A non-commissioned officer suddenly became unconscious, and remained in a state of coma for some days. He was pronounced to be suffering from cerebral syphilis. His blood, however, was negative when tested on three occasions. He was the father of healthy children, and he denied infection.

A young soldier gradually became hemiplegic without obvious cause. His blood did not react to the Wassermann test.

A non-commissioned officer consulted an ophthalmic surgeon while on furlough, who diagnosed disseminated choroiditis, and prescribed specific remedies. At the Royal Infirmary it was ascertained that he was suffering from chronic nephritis with albuminuric retinitis. He stated that he had never been infected, and that his wife and children were healthy. The reaction of his blood was negative.

The absence of a positive response in optic neuritis, tubercular laryngitis, ascites, glandular enlargements, suppuration of the antrum, ozœna, sycosis, seborrhœic dermatitis, psoriasis and scabies has prevented a mistaken diagnosis of syphilis, which was suspected.

The method devised by Wassermann entails the use of fresh guinea-pig's serum, sheep's red corpuscles from recently shed blood, and the serum of a rabbit which has received several injections of sheep's erythrocytes, by which an amboceptor, hæmolytic to them, is elaborated. If a guinea-pig is sacrificed on each occasion when the test is employed, the expenditure incurred becomes prohibitive. In order to obtain the cubic centimetre of blood, which may be all that is required, otherwise than by slaughtering the animal, vivisection licences are necessary for the laboratory and the experimenter. An inquiry, therefore, into the value of the modifications of the process which can be performed by unlicensed persons was demanded. For more than two years the writer has been occupied with this investigation. As the result of twelve hundred experiments, he has come to the conclusion that these modifications are trustworthy.

No difficulty is experienced in determining the reliability of modifications of Wassermann's reaction. It is only necessary to experiment with a sufficient number of syphilitic and non-syphilitic sera. The value of the test is established if the former behave constantly in a manner different from the latter. As most of the writer's observations were made in the laboratory of the Military Hospital, Rochester Row, London, he has had the advantage of learning how the bloods reacted, when Major L. W. Harrison tested them by Wassermann's original method. He is greatly indebted to this officer for the information and facilities which he afforded him.

Three modifications have been investigated—the sheep's blood, the guinea-pig blood, and the human blood method.

Sheep's Blood Modification.—The first process was introduced by Hecht, and has been followed by Fleming, Gibbon, Babington, Skelton, Bassett-Smith and others. It depends on the presence in human serum of an amboceptor hæmolytic to sheep's red blood corpuscles. An emulsion of washed red corpuscles from freshly shed sheep's blood and an alcoholic extract of heart are required. The latter is prepared by macerating the heart muscle of the guinea-pig, rabbit, or man, which has been reduced to a pulp in a mortar, in five times its weight of absolute alcohol. About a third of a cubic centimetre of the patient's blood is collected in a glass capsule from a finger prick. It is preserved for four to twenty-four hours, to allow time for the elaboration of the complement. The serum, which will amount to rather less than half the quantity of blood drawn, is removed with a pipette. One part is mixed with four parts of 0·9 per cent salt solution in distilled water, free from lime salts, in a small (0·6 by 4 cm.) test tube. Into other tubes are placed similar quantities of serum, and of the dilutions of the heart extract in the physiological saline fluid, thus

Tube 1	contains	0·02 c.c. serum and 0·08 c.c. salt solution.							
,, 2	,,	0·02	,,	,,	,,	0·08	,,	$\frac{1}{50}$ dilution	heart extract.
,, 3	,,	0·02	,,	,,	,,	0·08	,,	$\frac{1}{100}$,,	,,
,, 4	,,	0·02	,,	,,	,,	0·08	,,	$\frac{1}{200}$,,	,,

The tubes are put into the incubator for half an hour, or into a water bath raised to the temperature of 38° C. for five or ten minutes. At the end of this period such an amount of a 5 or 10 per cent emulsion of sheep cells is added that the fluid in each tube contains 1 per cent red blood corpuscles. It is important to avoid the addition of an excess of sheep's blood; for

if the corpuscles are too numerous, lysis is delayed. Until the observer's eye is trained, he is advised to dilute one part of his own blood with 99 parts of saline solution, which he uses as a standard. The tubes are then examined every minute or two. Tube 1, which contains no extract, and serves as a control, will show complete hæmolysis in five or six minutes. If the blood has been taken from a person free from the disease, lysis will also take place in the other tubes; though there may be a delay of some minutes in the hæmolysis of the fluid in the tube in which the dose of extract is highest. Should the serum be that of a patient in the early stage of secondary syphilis, before salvarsan treatment has been begun, no lysis will occur in any of the extract tubes. Even after repeated shaking, the cells will subside to the bottom, leaving the fluid above as clear as water. If, however, the patient has undergone efficient treatment, tube 4 may become reddened in half an hour, and tube 3 may also exhibit a trace of lysis after that interval. It must be remembered that the heart extract when present in quantities above a certain limit prevents the lysis of the sheep cells by normal blood. Hence each supply of extract must be titrated with many non-luctic sera in order to fix this limit. It is necessary to observe caution in interpreting the results if hæmolysis has been slow in the control tube 1. This indicates either that the complement, or the hæmolytic amboceptor, is insufficient. If the serum is wanting in complement, less extract will be required to deviate it. Incomplete lysis may occur in tube 2, even though the blood be normal. In such an event it would be desirable to repeat the test with serum which has been kept for either a longer or shorter time than that used in the first experiment. For though complement is generally at its maximum between five and twenty-four hours after the blood has been shed, it sometimes happens that this point is reached earlier or later. If the amboceptor hæmolytic to sheep cells is absent, the test fails. Stern eliminates this contingency by rendering the sheep corpuscles sensitive to the action of the complement by treating them with rabbit-versus-sheep serum; that is, serum derived from the blood of an animal which has received several injections of sheep's erythrocytes.

Two hundred and sixty-one sera have been tested by Hecht's process. Readings were not recorded sixty-seven times in consequence of delay, or absence of lysis in the control tubes, that is in 26 per cent of the observations. The reactions of the blood of fifty-five persons who had not been infected were negative.

	Total	Positive	Negative	Percentage of positive reactions
Primary syphilis	26	18	8	70
Early secondary syphilis	31	30	1	97
Late ,, ,,	19	17	2	89
Latent syphilis	62	43	19	70
Congenital ,,	1	1	—	—
Control, non-syphilitic	55	*Nil.*	55	—
Failures	67			
Total	261			

One hundred and seventy-two of these sera were submitted to the original Wassermann test by Major Harrison. The results agreed in 134 instances or in 78 per cent. On thirty-six occasions, or 21 per cent, the reading of the modification was positive, and of the original negative. These were cases of syphilis which had recovered clinically. Hence the modification is a more delicate test than the original.

The failures occurred for the most part before errors of technique had been overcome. A common fault was the addition of too large an amount of the emulsion of sheep corpuscles. Sometimes this emulsion had been preserved too long. Sheep's blood which has become dark red, and darkens again rapidly after shaking, is useless. In some early observations the dose of extract was too great, or the time when lysis took place in the control tube was not noted. The want of success, however, in 10 per cent of the sera was due to the absence of hæmolytic amboceptor. As was mentioned before, Stern remedies this defect by sensitizing the sheep cells. Major Harrison has experimented largely in this way. He finds that Stern's procedure is more delicate than the original Wassermann method. The writer can speak favourably of it.

Guinea-pig Corpuscle Modification.—This process is based on the presence in human blood of an amboceptor hæmolytic to guinea-pig's red corpuscles. This amboceptor is less frequently absent than the corresponding constituent which acts on sheep erythrocytes. The test is in every respect similar to the foregoing, except that guinea-pig cells are substituted for sheep's. Guinea-pig corpuscles are more easily laked than sheep's, hence the proportion of failures has been smaller, and the process has occupied less time.

Three hundred examinations have been made. Failures were noted thirty-one times, that is, in 10 per cent of the experiments.

	Total	Positive	Negative	Per cent positive
Primary syphilis	23	9	14	39
Early secondary syphilis ..	35	31	4	89
Late ,, ,, ..	47	30	17	64
Latent syphilis..	118	63	55	53
Controls, non-syphilitic ..	46	*Nil.*	46	—
Failures..	31			
Total	300			

Major Harrison tested 264 of these sera according to Wassermann's method. The readings agreed 230 times, that is, in 87 per cent. On 27 occasions the response by the modification was positive, and by Wassermann negative. Seven times only did the contrary happen. Hence latent infection can be detected more surely by this modification than by Wassermann's test. Half of the failures were caused by the absence of the hæmolytic amboceptor in the human serum.

Human Corpuscle Modification.—This method is that which is most suitable for general use, since the ingredients are stable, and can be preserved indefinitely. A serum diagnosis, therefore, may be made at any time. A description of the process was inserted in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS for October, 1910. The substances required are the heart extract which was before described, and a rabbit serum hæmolytic to the red blood corpuscles of man. This is prepared by injecting 10 to 40 c.c. of washed human erythrocytes into the peritoneal cavity of a rabbit at intervals of five days, on three or four occasions. The blood is aspirated from the heart nine days after the last dose. The patient's blood is allowed to remain in the glass capsule in which it is collected from a finger-prick, for four to twenty-four hours, as in the previous methods. The clear serum is then withdrawn. The pipette is introduced again into the bottom of the capsule, or into the blood-clot, and such a quantity of red corpuscles is taken up as to make a 5 per cent mixture when they are added to the serum. One volume of this mixture of serum and corpuscles is put into a tube with four volumes of saline solution, and similar quantities of serum and extract dilutions are placed in other tubes. The fluid in each tube, therefore, contains 1 per cent of red corpuscles derived from the blood under examination. Thus :—

Tube 1 contains 0·02 c.c. serum and corpuscles and 0·08 cc. saline.
,, 2 ,, 0·02 ,, ,, ,, 0·08 ,, $\frac{1}{50}$ dilution of extract.
,, 3 ,, 0·02 ,, ,, ,, 0·08 ,, $\frac{1}{100}$,, ,,
,, 4 ,, 0·02 ,, ,, ,, 0·08 ,, $\frac{1}{200}$,, ,,

The tubes are placed in a water bath at 38° C. for five minutes, or into the 37° C. chamber for half an hour. At the end of this time the red corpuscles are seen lying at the bottom of each tube; the fluid above them is untinted, as no lysis has occurred. To each tube are now added five hæmolytic doses of the rabbit-*versus*-man serum, namely, 0·01 c.c. The tubes are shaken and kept under observation. Lysis will be complete in tube 1 in from three to fifteen minutes. If the blood has been obtained from a non-luetic source, hæmolysis will take place in the extract tubes, though there may be a delay of a few minutes in tube 2, which contains the largest dose. If the blood be that of a patient in the early stage of secondary syphilis, no lysis will occur in any of the extract tubes. The cells fall to the bottom and the fluid remains colourless for twenty-four hours or more. In latent syphilis, or if intensive treatment has been adopted, lysis may appear in tube 4 in an hour, and a faint trace may be apparent in tube 3, but the fluid in tube 2 will remain free from colour: a quantitative estimate of the serum is thus made.

Serum placed in each tube is 0·02 c.c., a convenient amount. It may be reduced by one-half if the supply of blood is small. The test can be performed successfully with only 0·2 c.c. of blood, though twice or three times as much is desirable. In any case, blood collected from a prick of the finger is sufficient. Venesection is not necessary.

When practising the test, three series of four tubes are used. The first contains normal serum, the second the serum of a florid secondary case, and the third the suspected serum. Comparison of the last with the other two, enables the observer to say to which category it belongs.

Six hundred and twenty-five sera have been examined by this method.

	Total	Positive	Negative	Positive per cent
Primary syphilis	45	22	23	51
Early secondary syphilis	83	77	6	93
Late ,, ,,	103	88	15	85
Latent syphilis	223	127	96	58
Congenital ,,	5	3	2	—
Ague	6	4	2	—
Scarlet fever	7	4	3	—
Hodgkin's disease	1	1	—	—
Mania	1	1	—	—
Controls, non-luetic	132	*Nil.*	132	—
Failures	19			
Total	625			

Comparative tests by Wassermann's method were made by Major Harrison in 204 instances. The results agreed 177 times, which equals 87 per cent. In eighteen cases of well treated, or latent syphilis the blood gave a positive response to the modification, though negative to Wassermann. In nine the Wassermann was positive, and the modification was negative.

Eighty-five of the specimens of blood were tested by the sheep's corpuscle method. The readings were concordant in 76 per cent of the experiments. On fourteen occasions the sheep blood reading was positive when the human corpuscle method was negative. These sera were negative when tested by Wassermann's procedure.

The guinea-pig blood modification was applied to 123 of these sera; 89 per cent of the results agreed. Accordingly the methods confirm one another.

An advantage which the human erythrocyte modification possesses over the former two, lies in the fact that one of the variables is eliminated. In the first two, both the complement and hæmolytic amboceptor may fluctuate in amount. In the third process, we add a constant quantity of hæmolytic amboceptor. The complement alone varies. Now a minimum dose of complement cannot effect lysis except in the presence of multiple doses of amboceptor. It follows, therefore, that if the quantity of complement in a serum is small, its hæmolytic action can still be exerted through the agency of the five units of hæmolytic amboceptor added, an influence which is wanting in the first two methods, since the proportion of natural hæmolytic amboceptor in human blood is not so high.

The action of human complement on human blood corpuscles which have been rendered sensitive with rabbit-*versus*-man serum is nearly as powerful as that of guinea-pig's. If we take two tubes containing a 1 per cent emulsion of such sensitive human erythrocytes, and add to one $\frac{1}{40}$ of its volume of six-hour-old human serum, and to the other a similar quantity of guinea-pig serum, it is often found that lysis is as rapid in the tube which contains the human complement as in the other.

With a fixed number of corpuscles, and a fixed dose of hæmolytic amboceptor, the time of lysis is a measure of the complement. Hence arises the necessity of examining the tubes every few minutes after the addition of the hæmolytic amboceptor. If lysis is complete at the same time in the control tubes which contain the normal, syphilitic and suspected blood respectively,

then the quantity of complement in each is similar, and the readings of the corresponding extract tubes are strictly comparable. The titration of complement, however, can be easily carried out. A ten-fold dilution of the serum in saline fluid is made; 20-, 40- and 80-fold dilutions are prepared from this. One volume of each of these is added to one volume of a 2 per cent emulsion of human red corpuscles, which have been rendered sensitive by means of five doses of rabbit-*versus*-man serum. The measure of the complement in each tube is therefore $\frac{1}{20}$, $\frac{1}{40}$, $\frac{1}{80}$, and $\frac{1}{160}$ of the volume of fluid, which now contains 1 per cent of red corpuscles. The period which elapses before hæmolysis occurs, is noted. Hæmolysis is complete in the $\frac{1}{20}$ and $\frac{1}{40}$ tubes within fifteen minutes, if the complement is present in normal quantity, or in other words, the titre of normal human serum is $\frac{1}{40}$. Since the proportion of serum employed in the modifications of Wassermann's reaction is eight times as great—for $\frac{1}{5}$ of the volume of the fluid in each tube is serum—the number of units of complement employed in these processes is eight.

If the blood be examined four to twenty-four hours after shedding, the amount of complement is not subject to great variations. In less than 2 per cent of the tests by the human blood method has the lysis in the control tube been delayed longer than twenty minutes. Though sufficient complement will have been elaborated at the end of four hours after taking the blood, it will be more convenient generally to perform the test on the following day. There is often still enough complement present at the end of forty-eight hours. It is not unusual to find it existing in small amount in three or four-day-old blood. As an exceptional experience, it was once discovered in human serum which had been preserved for nine days. It is in those cases in which we have not had an opportunity of examining the blood within twenty-four hours of its abstraction, that we scrutinize the rapidity of hæmolysis in the control tube. If there is retardation we estimate the deficiency of complement by titration and reduce the doses of extract in like proportion. Consequently the human blood modification admits the same precision as Wassermann's original method.

In both scarlet fever and ague the serum reaction was positive during the attack. It became negative in the convalescent stage.

Caan (*Münch. med. Woch.*, May 10, 1910, p. 1002) reported a positive Wassermann reaction in four cases of Hodgkin's disease; and Trembar (*Cent. f. Bakt.*, Ref. April 23, 1912, p. 523) stated

that he obtained a very strong Wassermann reaction in a fatal case of lymphosarcoma. In the patient examined by the writer there were neither signs nor history of a specific infection.

Syphilis could not be excluded with certainty in the soldier suffering from mania, whose blood gave a positive response.

Nineteen failures occurred in the 625 tests, which is equal to 3 per cent. They were caused for the most part by a delay in the examination of the blood beyond twenty-four hours.

Captain A. T. Frost, Specialist in Dermatology, Royal Infirmary, Dublin, to whom the writer is indebted for many samples of blood, and clinical reports, has himself employed the human erythrocyte modification for the examination of nearly 300 sera.

Conclusions.

(1) The modifications of Wassermann's reaction are trustworthy.

(2) The human corpuscle method is that which is most generally applicable. The components required are the complement in the serum, and a small portion of the erythrocytes of the blood under examination, heart extract, and rabbit-*versus*-man serum. The latter are stable.

(3) The human corpuscle method can be rendered as precise as Wassermann's original test by titrating the complement in the serum.

(4)[1] With a supply of Gunter and Wagner's "Pelican" Indian ink, heart extract, and rabbit-*versus*-man serum the detection of the *Treponema pallidum* can be secured, and the diagnosis of syphilis accomplished in every hospital where a microscope, pipette and tubes are available.

Heart extract and rabbit-*versus*-man serum may be obtained on application to the writer, at the Royal Army Medical College.

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[1] Journal of the Royal Army Medical Corps, August, 1912, p. 203.

SALVARSAN AND NEOSALVARSAN IN THE TREATMENT OF SYPHILIS.

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The importance of syphilis to the Army justifies the following further report on our observations regarding its treatment with salvarsan.

The following subjects are discussed in this paper: (*a*) The value of salvarsan as compared with that of an exclusively mercurial therapy in reducing the inefficiency of soldiers which is caused by syphilis; (*b*) the value of using mercurial injections in conjunction with salvarsan as compared with that of relying entirely on salvarsan; (*c*) the importance of early diagnosis and treatment; (*d*) the dosage of salvarsan; and (*e*) neosalvarsan. Some cases of re-infection which have occurred after salvarsan treatment will also be described.

In a previous paper we have shown that syphilitic soldiers who are treated with salvarsan, either alone or in conjunction with a course of nine mercurial injections, suffer considerably less from relapses and spend a shorter time in hospital during the first nine months of their disease than those who are treated exclusively with mercury.

We have now watched our salvarsan cases for considerably longer periods, and the results of our extended observations, which are shown in the following tables, prove the immense advantage of a salvarsan therapy over an exclusively mercurial one.

To avoid any possible bias in favour of salvarsan, the figures in these tables which relate to mercurial treatment have been taken from all the case sheets we could find of men who were treated with not less than nine injections of mercurial cream in the first course, rested for not more than eight weeks, received six injections in the second course, and were, in fact, thoroughly treated with mercury throughout the period of observation.

Table I shows the relapses which occurred amongst syphilis cases which were treated from the outset with salvarsan and the periods during which the patients were under observation.

We would draw attention to the marked difference which is illustrated in this table between the numbers of relapses which

occurred under mercurial injections on the one hand, and those which followed a combined course of two intravenous injections of salvarsan and nine intramuscular of mercurial cream, on the other. (See six to twelve months' period.)

TABLE I.—SHOWING THE NUMBER OF FRESH CASES OF SYPHILIS TREATED WITH (*a*) SALVARSAN, EITHER ALONE OR IN CONJUNCTION WITH MERCURIAL INJECTIONS AND (*b*) MERCURIAL INJECTIONS ONLY AND THE NUMBER OF RELAPSES WHICH OCCURRED AT DIFFERENT PERIODS UNDER EACH FORM OF TREATMENT.

		All cases				Primary cases only			
Period under observation	Method of treatment	Total cases	Total clinical relapses	Required readmission to hospital	Treated with more salvarsan subsequently to the first course because of positive Wassermann without clinical relapse	Total cases	Total clinical relapses	Required readmission to hospital	Treated with more salvarsan subsequently to the first course because of positive Wassermann without clinical relapse
6—12 months	Intramuscular of salvarsan	10	3	2	4	5	1	1	1
	1—4 intravenous of salvarsan	74	8	1	7	24	2	1	0
	2 intravenous of salvarsan and 9 intramuscular of mercury	104	3	0	2	40	1	0	0
	Mercurial injections only	102	85	–	–	38	36	–	–
12 to 23 months	Intramuscular of salvarsan	9*	2	1	6	4*	1	1	1
	1—4 intravenous of salvarsan	48*	9	1	4	17*	1	1	0
	2 intravenous of salvarsan and 9 intramuscular of mercury	20*	1	0	1	7*	0	0	0

* These are included in the corresponding totals under the 6 to 12 months' period.

Table II shows the number of primary cases treated with salvarsan and with mercury respectively, who developed secondary symptoms within periods of observation which ranged from six to twenty-three months. The thirty-six patients referred to in this table who were treated entirely with mercurial injections and who developed secondary symptoms did so in an average period of seven weeks so that it is fair to mention also that out of 101 patients whom we have treated with intravenous injections of salvarsan, and have observed for three months or longer, two only have

developed secondaries. In each of these primary cases the diagnosis was established by microscopical examination of the exudate from the sore.

TABLE II.—SHOWING THE NUMBER OF PRIMARY CASES WHICH SUBSEQUENTLY DEVELOPED SECONDARY SYMPTOMS UNDER EACH FORM OF TREATMENT: (*a*) SALVARSAN, EITHER ALONE OR IN CONJUNCTION WITH INJECTIONS OF MERCURIAL CREAM, AND (*b*) MERCURIAL INJECTIONS ONLY.

Period under observation	Method of treatment	Total cases	Total which developed secondaries
6—12 months	Intramuscular of salvarsan..	5	1
	1—4 intravenous of salvarsan	24	1
	2 intravenous of salvarsan and 9 intramuscular of mercury	40	1
	Mercurial injections only ..	38	36
12—23 months	Intramuscular of salvarsan..	4*	1*
	1—4 intravenous of salvarsan	17*	1*
	2 intravenous of salvarsan and 9 intramuscular of mercury	7*	0

* These are included in the corresponding numbers under the 6 to 12 months' period.

Briefly, the tables show that in periods ranging from six to twelve months the clinical relapses under exclusively mercurial treatment were 11·5 times as many as under salvarsan, while the proportion of primary cases which subsequently developed secondaries under exclusively mercurial treatment was thirty times as great as under salvarsan.

The Wassermann reactions given by patients who were treated from the outset with salvarsan are shown in Table III and those given by patients at different stages of the regular mercurial treatment are shown in Table IV.

In comparing the results in Table III with those in Table IV, it must be remembered that, other things being equal, a higher percentage of positive reactions is to be expected in the first than in subsequent years of the disease, and that the number of positive reactions tends to rise the longer the interval which has elapsed since treatment was suspended. The cases shown in Table III (salvarsan) were for the most part in the first year, and the intervals which had elapsed since treatment was suspended were greater than any shown in Table IV. Yet the percentages of positive reactions were lower in the salvarsan series than at any period shown in the mercurial series. With regard to the latter, the proportion of cases which gave a positive reaction three months after the termination of two years' regular treatment is significant.

TABLE III.—Wassermann Reactions, by the Original Method, given by Fresh Cases of Syphilis at Various Intervals of Time after suspending Treatment with Salvarsan.

Clinical stage of disease on commencement of treatment	Method of treatment	4—7 months				7—10 months				10—18 months			
		Total cases	Positive	Negative	Per cent positive	Total cases	Positive	Negative	Per cent positive	Total cases	Positive	Negative	Per cent positive
Primary and secondary	1 subcutaneous or intramuscular	9	2	7	–	4[1]	2	2	—	4[2]	0	4	–
	1—4 intravenous	72	17	55	23·6	37[3]	9	28	24·3	21[4]	4	17	–
	2 intravenous of salvarsan and 9 intramuscular of mercury	76	6	70	7·9	21[5]	2	19	9·5	4	1	3	–
	Totals excluding subcutaneous and intra-muscular	148	23	125	15·5	58	11	47	18·9	25	5	20	20
Primary only	1 subcutaneous or intra-muscular	5	1	4	–	2	2	0	–	2	0	2	–
	1—4 intravenous	21	3	18	14·2	9	1	8	–	7	1	6	–
	2 intravenous of salvarsan and 9 intramuscular of mercury	32	0	32	0	6	1	5	–	2	0	2	–
	Totals excluding subcutaneous and intra-muscular	53	3	50	5·6	15	2	13	–	9	1	8	–

[1] Excluding two cases under observation for this period, but treated with more salvarsan.

[2] Excluding one case under observation for this period, but treated with more salvarsan.

[3] Excluding one case under observation for this period, but treated with more salvarsan for positive Wassermann.

[4] Excluding thirteen cases under observation for this period, but treated with more salvarsan for positive Wassermann or clinical relapse.

[5] Excluding one case under observation for this period, but treated with more salvarsan for positive Wassermann.

A rough idea of the probable reduction of inefficiency from syphilis which the routine use of salvarsan is likely to effect may be gathered from Table V which shows that under salvarsan treat-

ment a syphilitic soldier is inefficient in the first year of his disease for thirty-three days, while under exclusively mercurial treatment he loses at least sixty-one days.

TABLE IV.—WASSERMANN REACTIONS GIVEN BY CASES OF SYPHILIS AT DIFFERENT STAGES OF THEIR TREATMENT WITH MERCURIAL INJECTIONS.

TESTED BY THE ORIGINAL METHOD

Tested at end of	Total cases	Positive	Negative	Per cent positive
1st course of 6—9 injections	92	68	24	73·9
1st interval of 6—8 weeks	22	16	6	72·7
2nd course of 4—6 injections	81	43	38	53·0
2nd interval of 2—3 months	29	20	9	68·9
3rd course of 4 injections	83	44	39	53·0
3rd interval of 2—3 months	36	20	16	55·5
4th course of 4 injections	124	43	81	34·6
4th interval of 4—6 months	42	24	18	57·1
5th course of 4 injections	67	24	43	35·8
5th interval of 4 weeks	61	16	45	26·2
6th or 7th course of 4 injections ..	115	43	72	37·3
3 months after end of usual period of treatment	289	123	166	42·5

TABLE V.—SHOWING THE NUMBER OF DAYS LOST BY A SYPHILITIC SOLDIER IN HOSPITAL AND ATTENDING AS OUT-PATIENT DURING THE FIRST YEAR OF HIS DISEASE.

	Days in hospital on first admission	Days in hospital on first re-admission for relapse	Attendances as out-patients assuming no relapse	Extra attendances as out-patient on account of relapses or positive Wassermann reaction	Totals
Mercury	27·9	9·1[1]	25	Not calculated	62
Salvarsan, intravenous, alone or combined with nine mercurial injections	21·5	0·25[2]	10	1·7[3]	33·45

[1] Calculated on assumption that 42 per cent of cases require re-admission at least once and then spend an average of 21·7 days in hospital.

[2] Calculated from Table I. Relapses which occurred in cases observed for twelve months and over, and required re-admission to hospital. Days in hospital on re-admission, 17.

[3] Calculated on basis of a combined course being administered, necessitating nine extra attendances.

That this is not overstating the case in favour of salvarsan is shown by the following facts in connection with this table. The figures under mercurial treatment take no account of second or

third re-admissions for relapse. The annual return of the Military Hospital, Rochester Row, for 1909, showed that 11·9 per cent of syphilis cases were re-admitted twice, and 2 per cent on three or more occasions during the first year. On the other hand, no case treated with salvarsan has yet been re-admitted more than once. No account has been taken of extra attendances made necessary by relapses under mercurial treatment which do not require re-admission to hospital. Of mercurial cases 48 per cent would require to attend more frequently on this account during the first year. Lastly, the relapses shown in the salvarsan series happened under *all* the methods of administering salvarsan excepting the intramuscular and subcutaneous which we have tried, and we now know that some of these are not so efficient as the method we now recommend.

The practical effect of adopting a routine salvarsan treatment of syphilis is illustrated in the following table which shows the average number of syphilis cases (excluding police and transfers from other stations) in the Military Hospital, Rochester Row, during the months of June and July, 1909, 1910, 1911 and 1912, and the number of admissions for syphilis during the same periods. The garrison remained practically constant during the years covered by this table, and we must attribute the reduction which is shown here to the shorter time spent in hospital on first admission, and the smaller number of re-admissions for relapse. The reduction in the work of the out-patient department is shown by the fact that in the year ending June 30, 1910, the number of mercurial injections administered was 4,006; while in the year ending June 30, 1912, it was 2,058. Many cases were still under mercurial treatment during the latter period so that we can expect a greater reduction in future.

TABLE SHOWING THE AVERAGE NUMBER OF PATIENTS IN HOSPITAL, EXCLUDING POLICE AND TRANSFERS, WHO WERE SUFFERING FROM SYPHILIS, AS WELL AS THE NUMBERS OF ADMISSIONS FOR SYPHILIS IN JUNE AND JULY, 1909, 1910, 1911, 1912.

	1909		1910		1911 [1]		1912	
	June	July	June	July	June	July	June	July
Numbers in hospital	35	42	46	39	31	33	15	9[2]
Admissions	24	22	30	21	22	16	12	9[2]

[1] Many cases were still under exclusively mercurial treatment at this time.

[2] Excluding one case of venereal sore under observation, no spirochætes found. Wassermann negative.

The following cases in which a reinfection has occurred will further illustrate the curative effect of salvarsan:—

Case 1.—Private McQ. December 14, 1910: Admitted to hospital. Early secondary symptoms. Wassermann reaction positive. *S. pallida* in chancre. December 16, 1910: Injection, 0·4 grm. salvarsan intravenously. December 30: Injection, 0·5 grm. salvarsan intravenously. January 2, 1911: No active signs. January 6: Discharged hospital. January 20, February 16, March 16, and June 14: Wassermann reaction negative. September 28: Admitted to hospital with another chancre on a different site. *S. pallida* found. October 5 and 29: Wassermann reaction positive.

Case 2.—Private L. January 10, 1911: Admitted to hospital. Primary chancre and general adenitis. *S. pallida* discovered. January 10 and 23: Injections, 0·6 grm. salvarsan intravenously. February 24, May 4, and September 27: Wassermann reaction negative. February 1, 1912: Readmitted hospital. Fresh primary chancre on another site on penis, numerous condylomata between toes, mucous patches on tonsils, general adenitis, &c. Wassermann reaction positive.

Case 3.—Private B. February 7, 1911: Admitted hospital. Florid secondary symptoms—chancre, adenitis, pustular rash, ulceration of tonsils and condylomata. Wassermann reaction positive. *S. pallida* discovered in chancre. February 9: Intravenous injection of 0·6 grm. "606." February 23, March 9 and March 23: Injections of 0·2 grm. "606." April 1: Discharged hospital. May 2, July 6, September 19, and January 10, 1912: Wassermann reaction negative. March 4, 1912: Readmitted hospital with a fresh chancre on different site. *S. pallida* discovered, papular rash, adenitis. Wassermann reaction positive.

Case 4.—Lance-corporal M. March 31, 1911: Admitted to hospital. Primary chancre in which *S. pallida* discovered. Wassermann reaction positive. April 1: Injection of 0·6 grm. "606" intravenously. April 15, April 29, May 13: Injections of 0·3 grm. "606" intravenously. June 22: Readmitted with fresh chancre on penis, different site. *S. pallida* discovered. Wassermann reaction positive.

Case 5.—Lance-corporal S. May 1, 1911. Admitted to hospital. Primary chancre only, in which *S. pallida* was discovered. Wassermann reaction positive. May 4: Injection, 0·6 grm. "606" intravenously. May 17, June 1, and June 16: Injection of 0·3 grm. "606." September 19: Wassermann reaction negative. November 24: Development of fresh chancre in another situation. *S. pallida* discovered.

All of the above cases were treated with salvarsan for the reinfection. In all the symptoms rapidly cleared up and the Wassermann reaction again became negative. None of them have shown any further signs of syphilis. With the exception of Case 4, which passed out of observation after two months, all have been followed up to the date of writing.

Whether we accept re-infection as evidence of absolute cure of the first attack, or not, we are bound to admit that it indicates

a complete suppression of the *S. pallida* in the tissues, a suppression which was seldom secured with the best mercurial treatment. C. F. Marshall has stated that in order to establish the fact of re-infection it is necessary for two distinct attacks of primary and secondary to have been seen in the same patient by the same observer. The same author has suggested that some of the cases of supposed re-infection which have been reported after salvarsan treatment may have been suffering from chancriform gummata. We do not think it necessary for the patient to have suffered from two attacks of secondary syphilis to prove re-infection. This may have been necessary in the days when the diagnosis of a primary sore rested solely on the uncertain ground of clinical evidence, but now it is sufficient evidence of the first attack that *S. pallida* has been demonstrated in the sore, and we think that re-infection is proved if the second sore occurs at a reasonable interval from the first, is on a different site, has the clinical appearance of a primary sore and contains *S. pallida* in large numbers. As for the suggestion that these new sores on the penis may be chancriform gummata, we can only say that such lesions seem to have been reported in extraordinary numbers since salvarsan was discovered, while *S. pallida* is not usually found in such large numbers in gummata as we found in the sores which we have described as examples of re-infection.

Good as these results of salvarsan treatment are we have reason to believe that better will be obtained in future by using mercurial injections in conjunction with salvarsan, instead of relying exclusively on salvarsan. In Tables I, II, and III we have divided our salvarsan cases into three groups: (1) Those treated with a single subcutaneous or intramuscular injection of salvarsan; (2) those to whom we administered one or more intravenous injections; and (3) those who were treated with an initial intravenous injection of 0·6 grm. salvarsan, then nine intramuscular injections of mercurial cream at weekly intervals, and, lastly, an intravenous injection of 0·6 grm. salvarsan. A comparison of the relapses under each of these groups will show that while a subcutaneous injection is not nearly so permanent in its effects as one or more intravenous, the results obtained by either of these methods are easily surpassed by those which follow the combined course of mercury and salvarsan we have described.

We may say that we are treating a series of cases with three fortnightly intravenous injections of salvarsan and four injections of calomel cream, the idea being to see if the initial course of

treatment can be made shorter. So far, however, the results have not been so good with regard to the Wassermann reaction, and for the present we recommend the combined course of salvarsan and mercurial cream injections as the one which appears most likely to give the best results.

In a previous paper we have mentioned the great importance of commencing treatment in the primary stage of the disease; if possible, before there is any induration of the sore or the Wassermann reaction has become positive. Reference to Tables I and III will show that the primary cases relapsed less frequently and gave a lower percentage of positive Wassermann reactions at different periods than the group comprised of all the fresh cases we have treated with salvarsan. Further, out of 101 primary cases treated with salvarsan and under observation for three months or longer only two have developed secondaries. It should also be mentioned that five out of the nine primary cases which subsequently gave a positive Wassermann reaction were positive before treatment was commenced. The four cases which were negative beforehand were treated, one with a single subcutaneous injection and three with four intravenous injections, neither being methods of treatment we would now recommend. It is clear from these results that it is well worth while to use every effort in encouraging men to report sick early and in making the diagnosis with the least possible delay.

The question of dosage of salvarsan is one which has lately arisen in connection with certain fatalities after salvarsan injections. Regarding the subject of deaths, we may say at once that in forty-three subcutaneous or intramuscular and 1,613 intravenous injections we have not experienced any untoward incident, while Wechselmann states that, in the course of over 12,000 injections, he has not had any death which could be attributed to salvarsan. When we consider that probably more than a million injections must have been given all over the world, fatalities amounting even to a fraction per thousand of the injections could not have been concealed and would have filled a prominent place in the literature. Dreyfus has collected and analysed the records of 150 deaths after salvarsan. After eliminating those in which the death was either due to faulty technique, or was a coincidence, or followed gross disregard of well-known contra-indications, about a dozen were left which could be attributed to salvarsan poisoning. Excluding, again, those which were due to decomposition of the drug at the site of an intramuscular injection,

a few remain which have been reported by Marschalkó and Veprémi, Queyrat, Lesser, Kannengiesser, McDonnell, and others, and are not so easy to explain. The symptoms and post-mortem appearances presented by these cases subsequently to the injection were very similar and indicated a common factor in their causation. Briefly, a few days after an injection there ensued epileptiform convulsions, then coma, and death on the third to the fifth day, and the autopsy showed punctiform hæmorrhages in the brain and basal ganglia.

Professor Ehrlich, noting that these fatalities have almost always occurred in patients who were suffering from early generalized syphilis, believes that they are due to the liberation of endotoxins from spirochætes in the brain. On this account he recommends that in early generalized syphilis—that is, after the sore has indurated, the inguinal glands enlarged and the Wassermann reaction become positive—the treatment with salvarsan should proceed very cautiously. His directions are, first, to administer two intramuscular injections of calomel, then 0·1 grm. salvarsan, then two more injections of calomel, and, a few days later, 0·15 grm. salvarsan. Only when it is seen that this is well borne would he increase to a full dose. In cases of early primary syphilis, on the other hand, he recommends a full initial dose of salvarsan and intensive treatment from the commencement with a view to aborting the disease.

For reasons which we may shortly mention, we have found some difficulty in accepting Ehrlich's explanation of these deaths. It is likely that, whatever their immediate cause, most of the fatalities would fall into the group of early secondary cases since this must comprise the vast majority of cases treated with salvarsan. But not all the deaths of this kind have occurred in early secondary cases. Lesser reports a similar death in a patient whose disease was of fifteen years standing, while Marschalkó and Veprémi report one in which the patient had contracted the disease twenty years previously and was apparently in good health. Again, if death were due to liberation of endotoxins one would expect it to occur after the first dose when, presumably, the greatest number of spirochætes are destroyed. In the majority of these cases, however, the fatality occurred after a second injection administered within a week or eight days of the first.

It seems to us reasonable to suppose that, apart from the fact that, as Yakimoff has shown, the toxicity of salvarsan may be increased by the use of impure distilled water and salt solution,

some patients may be very exceptionally susceptible to salvarsan, however carefully prepared. This susceptibility may possibly be increased in the early secondary stage, and is certainly increased by such indiscretions as violent exercise, alcoholic excess and railway travelling a few hours after the injection—a matter of some importance to those responsible for the after-treatment of salvarsan cases.

It is especially noteworthy that most of these deaths have followed the second of two injections which was given at an interval of eight days or less, and it is possible that the drug has exercised a cumulative action in these cases.

Marschalkó and Vesprémi claim to have produced the same symptoms and post-mortem appearances in rabbits by overdosing them with salvarsan.

The true explanation of these fatalities is important, because if we believe with Ehrlich that they are due to the liberation of endotoxins we should proceed fearlessly to treat our early primary cases with full doses of 0·6 grm. salvarsan, but would exercise considerable caution when the disease has become generalized. If, on the other hand, the cause lies in exceptional idiosyncrasy the routine procedure would be much easier. We should not let our patients commit any of the indiscretions we have mentioned, nor repeat the injection at such a short interval as to cause any cumulative action, and we should try to ascertain if the maximum effect of one intravenous injection can be achieved with a smaller dose than 0·6 grm. We do not think the last is nearly so important as the first two precautions we have mentioned. We have not been able to find accounts of more than three cases where a patient in apparently good health died after an initial dose of 0·6 grm. salvarsan which was properly administered, and we believe that, if care be taken not to repeat the injection too quickly, if punctilious regard be paid to details of technique (asepsis, freshly distilled water, freshly prepared solutions, &c.), as well as to after-treatment, and if the contra-indications are properly considered, the risk of death after such a dose is infinitesimal, whether it is administered in the early primary or the early secondary stage of syphilis.

Some attention is due, however, to those workers who claim as good results from the injection of 0·3 grm. as those obtained by workers using the larger dose. In a previous paper we have expressed the view that, considering the rapid beneficial effect which follows an intramuscular injection and the well-known fact that absorption of the remedy from the site of such an injection

is very slow, it must require a very minute dose of salvarsan in the circulation to destroy all the spirochætes which can be reached by this means.

In the same paper we agreed with the opinions of those who consider that relapses are caused by spirochætes which at

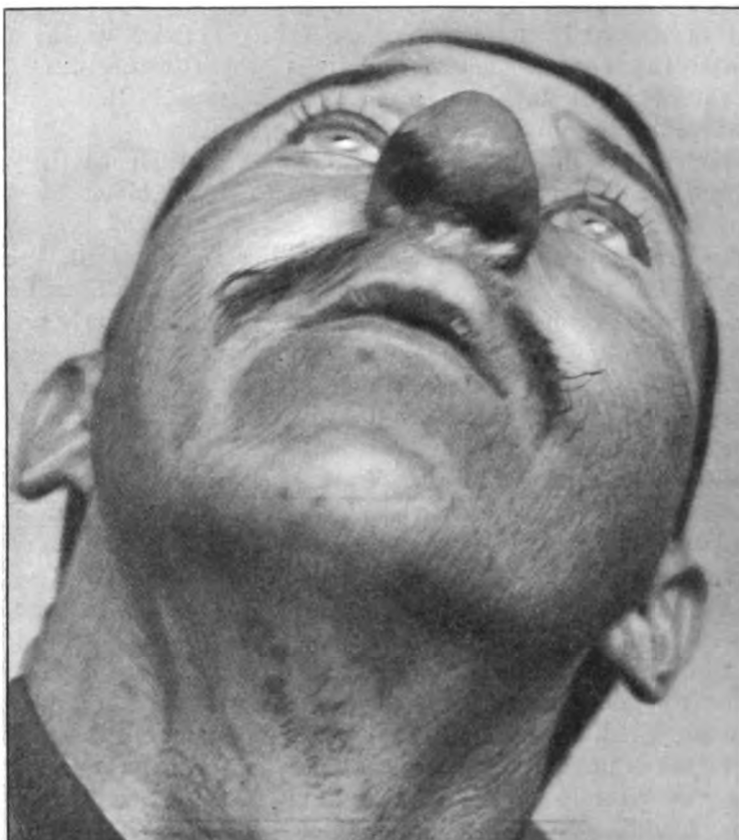

Fig. 1.—Syphilitic ulceration of nose of one year's duration. Contracted syphilis four years ago. Regular mercurial and iodide treatment with tonics.

the commencement of treatment were buried in thrombosed vessels and sclerosed areas and consequently remained inaccessible to circulating fluids until after the first dose of salvarsan had been excreted. If this be true it is possible that the administration of 0·6 grm. in any one injection may effect no more

than would 0·3 grm. To borrow an example from bacteriological technique, when we sterilize by the intermittent method, one hour's steaming on any one day is no more effective than steaming for half that time, nor does it save us from the necessity of repeating the operation on two more days. In order to test this possibility we have lately commenced a series of cases to

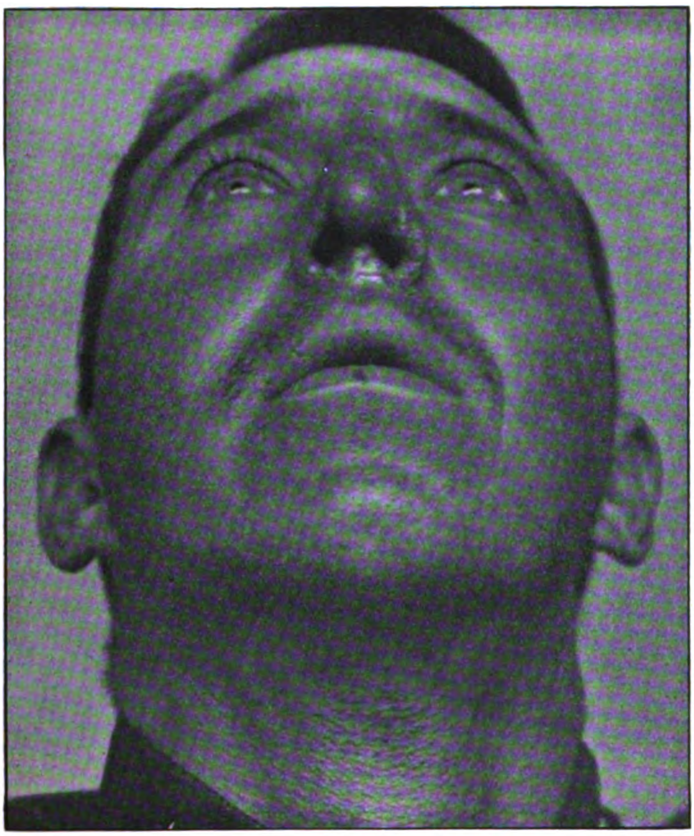

FIG. 1A.—Same case as 1, thirteen days after commencing neosalvarsan treatment. Treated with 0·9 grm. neosalvarsan, two days' interval; 0·9 grm., eleven days' interval; and, lastly, 1·3 grm.

whom we are administering three injections of 0·3 grm. salvarsan in four weeks and four calomel injections in the same month, and intend to compare the results with those obtained in a series of fifty cases which we have treated similarly, except that the dose of salvarsan has been 0·6 grm.

Neosalvarsan.

Professor Ehrlich very kindly gave us a generous supply of neosalvarsan, or "914," and we have treated a number of cases with it. The new preparation is very readily soluble in water, or, as Ehrlich recommends, in 0·4 per cent sodium chloride solution, in which it forms a neutral solution, and is ready for injection as soon as it has dissolved. It is not so stable as salvarsan, being converted into a very toxic compound if dissolved

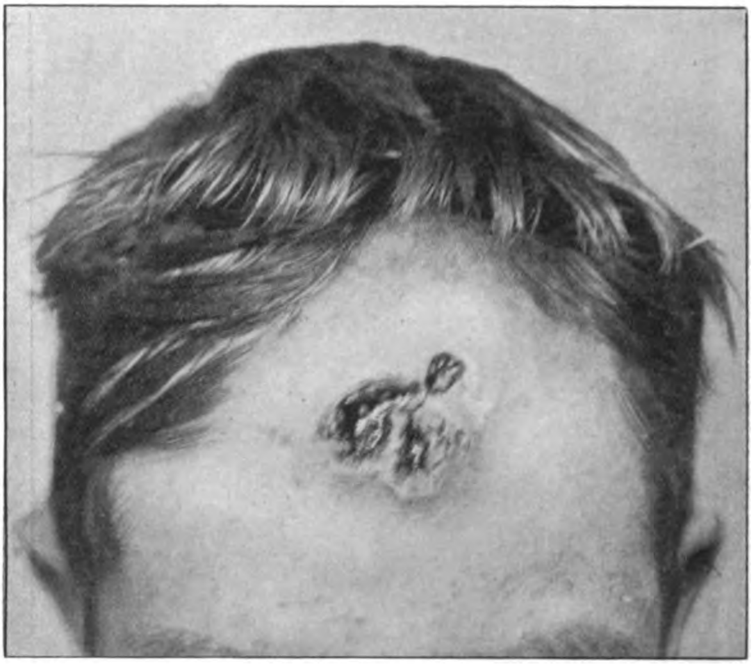

Fig. 2.—Gumma of frontal bone, with ulceration of six months' duration. Contracted syphilis four years ago. Energetic treatment with mercury, potassium iodide and iodipin.

in water which is above 80° F., or in physiological salt solution, or if unduly exposed to air. It should therefore be dissolved and administered in water, or 0·4 per cent salt solution, at room temperature and injected at once.

In administering neosalvarsan our technique has been as follows: Using the apparatus we employ for salvarsan, the procedure is the same up to the point where everything is ready

for the remedy to be poured into one of the funnels, except that distilled water is used instead of physiological salt solution. The patient is then put on the table, and the skin over the site of the proposed puncture sterilized. Not till then is the tube of neo-salvarsan opened and its contents dissolved in distilled water (0·9 grm. in 150 c.c.) at room temperature. The remedy dissolves at once and is poured into the funnel prepared for it. In order to avoid having to inject so much distilled water as is contained in

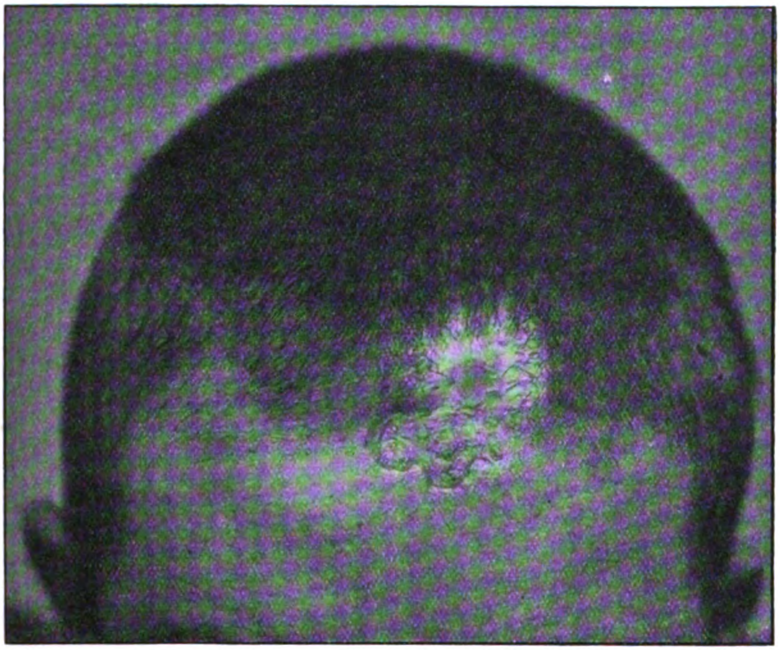

FIG. 2A.—Same case as 2, after neosalvarsan treatment. Treated with 0·9 grm. eight days' interval; 1·2 grm., seven days' interval; and, lastly, 0·9 grm. neosalvarsan.

the rubber tubing between the funnel and the needle, before puncturing the vein the clip which controls the tube leading from the neosalvarsan is opened, and the distilled water in the rubber tubing is run off till the neosalvarsan solution has reached the lowest glass window. The technique is then the same as in administering salvarsan. We have not ventured to administer such enormous doses or to repeat the injection after such short intervals as Schreiber and others have done, and the largest amount we have given has been three doses of 1·2 grm. at weekly intervals. Since

3 of neosalvarsan is equivalent to 2 of salvarsan this would correspond to three doses of 0·8 grm. salvarsan. Ehrlich now recommends that workers should not administer neosalvarsan in doses any larger than those which correspond to safe amounts of salvarsan, nor any more frequently. Reactions are much less frequent after neosalvarsan than after the older preparation. The therapeutic effect of neosalvarsan seems to be much the same as that of salvarsan, as will be seen from the illustrations, but it is much too early to speak of its permanence. The chief disadvantage of neosalvarsan is its instability; its advantages are that it is very quickly prepared and causes reactions less frequently than the older preparation.

We are indebted to Professor Ehrlich for kindly giving us a supply of neosalvarsan and for his very valuable advice on many points. We would also like to record here our appreciation of the help we have received from numerous brother officers who supplied us with monthly reports on the progress of many of our cases and from Mr. Gibbs, Royal Army Medical College, to whose photographic skill we are indebted for the illustrations in this article.

THE VACCINE TREATMENT OF GONORRHŒA, WITH NOTES ON THIRTY CASES.

By Captain A. T. FROST.
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The literature on the subject of gonorrhœal vaccination is so contradictory that a trial of this method of treatment was decided on in December, 1910. The various reports on vaccines were consulted, and the following résumé was compiled.

The dosage of vaccine has varied from 500,000 to 1,000,000,000 gonococci in acute and chronic disease respectively. Each bacteriologist prepared the vaccine in his own way, so that there was only an approximate relation between the immunizing power of similar doses in any two vaccines.

The following record of some 300 cases treated by gonococcal vaccine has been extracted from literature.

Hale White and Eyre [1] treated four cases of chronic gonorrhœal arthritis which were unaffected by local or general medication. Opsonic control was employed. In two of the cases four to ten million cocci were injected every seven days; this resulted in cure. Another case had an autogenous vaccine, of which he was given 5 to 25 million cocci with six days interval between the injections. The fourth also had an autogenous vaccine; 100 to 200 million cocci were injected, with complete recovery in five weeks.

Eyre and Stewart [2] published their results in fifty-three cases. The gonococcus was isolated and grown on blood agar. The twenty-four-hour-old culture was sterilized at 50° C. for one hour, and again heated at the same temperature for half an hour, after the addition of ½ per cent trikresol. Three to ten strains were used. After the first few injections, which contained as many as 100 and 250 million cocci, they did not give a higher dose than 25 million cocci.

In acute gonorrhœa, they usually employed a dose of 5 million cocci; this was followed by a negative phase lasting three to four days, after which a strong positive reaction set in. They advise daily opsonic index observations. If the index is variable, they recommend a dose of ½ to 1 million cocci, if it is steady 2 to 5 million cocci are injected. In chronic infections small injections were found to be more beneficial than large ones; the best results were obtained with 1 to 2 million cocci, every three to five days, or 3 to 5 million

every five to seven days, or 10 million with an interval of eight to ten days. In orchitis a small dose is best.

Hartwell [3] in discussing gonorrhœal arthritis, states that of thirty-one subacute cases, twenty-seven made perfect recoveries. In chronic affections vaccines are not of much benefit, especially if ankylosis is present. His vaccine is sterilized at 60° C. for one hour, or kept on ice all night, then lysol added and allowed to act on the organisms for twelve hours. The strength of the lysol is 0·25 per cent. The author did not find any difference between the heated and unheated cultures. The most efficient initial dose for acute arthritis was 10 to 25 million cocci; for chronic cases as many as 600 million cocci have been injected. The interval between inoculations was two to four days in acute cases, and five to seven in the more chronic affections.

Aronstam [4] treated fifty-four patients with stock vaccines, and no local applications. The average time under treatment was three weeks. Three to eight injections were required to effect a cure. He summarizes the results of his experience by stating that recovery from acute gonorrhœa takes place in four weeks, without injections or irrigation, that vaccines act well in epididymitis, and prostatitis. He also observed that latent arthritis became manifest under the vaccine treatment, but was eventually relieved.

Ballinger [5] made use of a mixed vaccine in mixed infections, and a stock culture in uncomplicated gonorrhœa. In addition he had recourse to massage, injections, and irrigation. He considers massage of joints at the same time as vaccination inadvisable, owing to the liability of causing a negative phase. In acute cases he gave from 5 to 10 million cocci, in chronic cases up to 50 million cocci, beginning with a dose of 15 million cocci, and allowing five to eight days' interval between the injections. His conclusions are favourable, if vaccination is only looked on as an adjuvant to local treatment.

Dieulafoy [6] describes the course of a case of gonorrhœal septicæmia, with typhoid symptoms which recovered. He made a culture from the blood in peptone ascitic broth, obtaining a pure culture of the organism in thirty hours. He gave a vaccine containing 5 millions of this organism, after which the temperature dropped to normal. Three days later the same dose was repeated with marked benefit. A third injection of 10 millions was followed by complete recovery.

Carl Mianini [7] reported *in extenso* four cases of arthritis, and showed the interdependence between the opsonic index and the size

of the dose. The first patient had 2 million gonococci injected. His opsonic index before the injection was 0·84; after the injection it fell to 0·42; the fall was accompanied by an increase in all the symptoms. The second dose was reduced to 1 million. Six days later the index was 0·83, and he appeared much better. The joint pains returned after a week's freedom from symptoms, and twenty-six hours after an injection of 200 million cocci again disappeared. A relapse of pain on the seventh day was treated by an injection of 300 million cocci; pain left the joints that evening. His opsonic index at the end of the course was 1·23. The second case received a first injection of 30 million cocci, as he had an index of 0·96; this then fell to 0·73. In five days the opsonic index had risen to 1·42. In all, five doses gradually increased to 350 million cocci were given. The third case had an initial dose of 4 million cocci, followed at intervals of three, five, six, and eighteen days respectively, by 30, 100, 150 and 200 million cocci. The opsonic index varied after the doses thus: at first the index was 0·96; this fell to 0·47. The next index was calculated as 0·54; five days later it was 0·89. On the fourteenth day it was 1·28, and on the thirty-second day it had fallen to 0·68.

Case 4 had an index of 1·12 before the first injection, which contained 250 million cocci. Next day all pain had ceased. On the third day 100 million cocci were given and the opsonic index was 0·78. The daily record showed a lower index each day and an increase in the pains. Two days later 400 million cocci were injected; this was followed by a rise in the opsonic index to 1·04. Seven days after the last injection the patient received another 400 million cocci, and his opsonic index fell to 0·47. There was no relapse from this time, and massage was resorted to.

In conclusion the author is of opinion that the loss of pain is not to be taken as an index of the cure of the disease; it only shows that gonococcal vaccine has a specific action on gonorrhœal arthritis.

Thomas [8] gives three years' experience of specific immunity. He describes the treatment of gonorrhœal vulvo-vaginitis in children, and shows brilliant results from injections of 5 million gonococci. Four joint cases were either cured or improved with a dosage of 50 million gonococci. Autogenous vaccines have given the best results in his hands. Finally, the author states that vaccination is only an adjuvant to local treatment.

Irons [9] made his vaccine from organisms heated to 60° F. for one hour. When a dose of 500 million cocci was experimented

with, the reaction started within twelve hours and persisted for twenty-four hours. With 50 million cocci there was little or no reactive response. In summarizing his results, he comes to the conclusion that the action of vaccine therapy is better in the case of infected joints than in any other form of gonococcal infection.

W. Friedlander and Reiter [10] in discussing the various complications of gonorrhœa say that in acute, subacute and chronic epididymitis, vaccines give the best result. Reiter's preparation was used in doses of 0·2, 0·3, 0·4, 0·6, 0·8 and 1 c.c., each cubic centimetre containing 5 million gonococci. The interval between injections was three days. Infiltration disappeared very rapidly, leaving only a small nodule. Deep lesions appeared to heal before the original focus in the mucous membrane; the urethral discharge remained unchanged.

In acute prostatitis improvement was not noticed. However, in acute and subacute follicular prostatitis both the objective and subjective signs of the disease were quickly ameliorated. Spermocystitis was improved, but not cured. Infection of the ducts of Bartholin's glands was not influenced by vaccination.

Allen [11] has come to the conclusion that in gonorrhœal infections phagocytosis and opsonin formation is not of as much importance as in some of the other vaccine-treated diseases. In support of this, he mentions that two cases of gonorrhœa with equally numerous cocci in the pus leucocytes, give widely different results in culture ; thus, one may produce a poor growth, the other an abundant one. He has had very encouraging success in acute disease. As an initial dose, the author recommends 25 million cocci, followed by a similar dose ; later doses may be increased up to 50 million cocci. In addition a mild antiseptic irrigation should be carried out at the same time. If the cure is not complete in two or three weeks, as is usual in his cases, the injections are increased, even as many as 1,000 million cocci being given. No secondary complications were met with and he says that in all cases the vaccine should be increased till good results follow.

In reviewing the foregoing work done by various authors the following conclusions have been arrived at. There is unanimity of opinion that vaccine therapy is an advance on the ordinary medicinal method. There is also an agreement on the necessity of high dosage in arthritis of gonorrhœal origin. Acute gonorrhœa may be cured if treated with irrigation; massage of the prostate is required in posterior urethritis, and sounds in the more chronic disease, with or without internal

treatment. The average time in which recovery can be assured is six weeks, provided that the patient begins his course of irrigation, &c., in the very earliest days of his attack. Both Aronstam and Allen have succeeded in curing urethritis with vaccines in three weeks, the former without any other aid, the latter with mild antiseptic irrigation. On the other hand, most of the authors who have tried inoculation for uncomplicated gonorrhœa state that there is not much advantage to be gained therefrom. The general consensus of opinion appears to be that the deeper the lesion the more active is the immunizing power of gonococcal vaccine.

Preparation of Vaccine.—In an article by Martin [12] in the *Journal of the Pathological Society*, on the growth of the gonococcus, he describes a culture medium which has given excellent results in his hands.

Following his procedure a medium was made containing:—

Beef extract broth, to which was added
Disodium phosphate 0·5 per cent,
Witte's peptone 1 per cent,
Agar agar 2 per cent.

When sterilized in test tubes the medium is "slanted" and kept till required. A patient with a gonorrhœal discharge from his urethra, from whom it is desired to make a gonococcal culture, is brought to the pathological laboratory. The glans penis is cleaned with absolute alcohol, and allowed to dry. Two tubes of the medium have the surface of the agar evenly smeared over with about four drops of sterile hydrocele, ascitic or pleuritic fluid. The tubes are now placed in the incubator until they become heated to 37° C. The first part of the urethral discharge is removed from the tip of the penis; two loopfuls of the deeper discharge at the meatal orifice are taken on a platinum needle and quickly transferred to the surface of the agar slope which is marked, and returned to the incubator. A pure culture, or at least isolated colonies, can be subcultured on a similar medium. A large percentage of excellent growths of the gonococcus in pure culture was obtained in this way.

A twenty-four-hour-old culture in 1 per cent sodium chloride is sterilized by heat applied for an hour at 59° C. The vaccine is diluted till 5 minims contain 20 million gonococci. At first three cultures from three cases were mixed, but at a later period, and when better results were got by culture, ten different cultures entered into the vaccine. To keep the vaccine sterile, ½ per cent

lysol was added to the stock, which was stored in rubber capped bottles, 20 c.c. in each.

Of the thirty cases, twelve had a vaccine procured from one of the large manufacturers, the remainder had a vaccine made from a case of gonorrhœa acquired locally as detailed above.

In beginning the systematic vaccination of the thirty cases our idea was to investigate whether the opsonic index could be dispensed with, and whether vaccine inoculation for gonorrhœa could be made a simple clinical method devoid of dangers and capable of employment without the aid of laboratory technique. Gonorrhœa is here meant to include acute, chronic, and blood-stream infections. No attempt was made to select cases. All cases which were admitted into the Royal Infirmary, Dublin, during the period were treated in the same way, with the exception of some cases of mixed gonococcal and other organisms; in these cases cultures of the *Bacillus acidi lactici* were injected into the urethra.

Case 1 had been in hospital since September 5, 1910. He had two or three exacerbations of the disease during October and November. Examination by the urethroscope showed a condition of soft infiltration along the whole of the urethra. A pure culture of gonococcus was isolated from the deep urethra. The first dose of gonococcal stock vaccine was injected on November 29, 1910, dose 5 million cocci. Four days later 50 million cocci were given, and no reaction followed. In forty-eight hours the urethral discharge had ceased for the first time since early in November. The third injection was given on December 10, 1910, as a return of the discharge occurred with threads in the "anterior" urine glass (Thompson's two-glass test). On December 17, 1910, these threads contained a bacillus, but no gonococcus. A culture on ascitic agar of one of these threads produced a diphtheroid organism, and a grey non-liquefying coccus. The *B. acidi lactici* from one of the proprietary tablets "Saurin" was grown on 1 per cent extract of malt in agar. The pure culture incubated for twenty-four hours on the medium just mentioned was emulsified in salt solution and injected into the urethra by means of Ultzmann's instillation syringe. This was followed by an increase of pus for twenty-four hours, and the threads disappeared. The injection was repeated three days later, and an irrigation of permanganate of potash was given next morning. Threads and discharge from the urethra ceased and no further signs of gonorrhœa have recurred.

This patient was one hundred and sixteen days under treatment, but was only forty-five days under vaccine therapy. The gonococcus alone was the pathological factor for ninety-six days, the secondary infection only occurred in the last three weeks.

B. acidi lactici has been the object of some investigations by Cannata and Mitra [13], as to its action on various pathological organisms. The point of interest as regards this paper which was elicited by them, is that the *B. acidi lactici* has a decided bactericidal action on organisms of the typhoid, paratyphoid, and dysentery groups, and also on the staphylococci; while the *B. coli* group, *B. pyocyaneus* and *B. prodigiosus* are practically unaffected by contact with the organisms of the lactic acid family.

Case 2. The next case, also treated by *B. acidi lactici* in addition to vaccines, is of interest owing to the unusually numerous gonococci in the urethral discharge, and the copious growth on the disodium phosphate pleuritic fluid agar. Though the diplococci looked like gonococci microscopically, and were also Gram negative, the appearance on the medium was more like a rather transparent culture of *Staphylococcus albus*. However, no growth could be obtained on ordinary agar, and subcultures on the special medium gave positive results. Three weeks irrigation with permanganate of potash solution did little more than lessen the amount of discharge, but made no impression on the number of gonococci.

To test the effect of *B. acidi lactici* on the gonococci an emulsion of the bacillus similarly prepared to that used in the last case was injected on March 4, 1911; no change was noticed in the urethral discharge, or in the infecting organism.

On March 6, 1911, a second injection was given of *B. acidi lactici;* this was followed by a copious discharge of pus, much pain in the prostate, in fact an acute attack of prostatitis. Two days later permanganate of potash irrigation was resumed. The "local" stock vaccine had now been prepared, and a dose of 50 million was given on March 13, 1911. No reaction followed. Doses of 20 million were injected with weekly intervals. A slight reaction followed the fourth vaccination. At this time the discharge had disappeared and only a slight "haze" remained in the urine, but prostatic pain and frequent micturition were still present. The dosage of gonococci was increased in the following weeks to 35, 40 and finally 100 million; the patient had a slight local reaction after each inoculation; irrigation was continued all through this period. The prostate did not improve to any great extent until sounds and massage were resorted to, when the change was at

once marked. This case was ninety-six days under treatment and neither vaccine or *B. acidi lactici* had a curative effect.

Case 3 had a pure gonococcal infection and a pure culture of the gonococcus was isolated. Potassium permanganate irrigation was begun on admission, but as the urethral discharge did not clear up rapidly another trial was given to the *B. acidi lactici*. One urethral injection was employed on March 4, 1911, on which date gonococci were found in the discharge. Two days later no discharge could be expressed, and a second syringeful of bacilli was introduced high up in the urethra. A third dose was given on the following day. No unpleasant effects followed these injections, and irrigation with Condy's fluid caused the disappearance of the introduced organism immediately. On March 10, 1911, only a faint haze could be seen in the urine. Two vaccinations with his own gonococci with a three-day interval completed the cure of this case. The number of days under treatment was twenty-six. Whether one should attribute the rapid cure of this man to the *B. acidi lactici* or not, is a difficult question to answer, but the fact remains that the discharge from his urethra disappeared and gonococci could not be found within forty-eight hours of beginning the bacillary applications.

From Case 4 a pure gonococcal culture was isolated, and grown to many generations. He had two injections of "manufacturer's" vaccine, of 25 and 50 million respectively at an interval of one week; this treatment was followed by an increase of both the discharge and the number of gonococci. Nitrate of silver was substituted for Condy's fluid as a douche for the urethra, with improvement in the urethritis.

On March 4, 1911, an emulsion of *B. acidi lactici* was injected and also on the following day. No discharge was visible after the second dose, until March 18, 1911. A "local" stock gonococcal vaccine had by this date been made, and five doses were given, beginning at 12 million, while the fifth contained 32 million gonococci. There was a slight reaction after the fourth dose in the form of an increase of discharge; no organisms, however, were found. Before this patient was considered clear he was under treatment for eighty-six days, and a really satisfactory result was not obtained, either with the vaccine or with Massol's bacillus.

The next case (No. 5) was one of anterior and posterior urethritis, with papillomata on the glans penis associated with a septic condition of these warts. Owing to the complication of sepsis on a chronic gleet, this is not a fair test of the time required

for treatment by vaccine. The case is mentioned here to show that the lactic acid bacillus has a decided influence on septic processes. Two injections of 50 million cocci, each at fourteen days' interval, had the effect of eliminating gonococci, but not the discharge; the warts were still in a very purulent state in spite of constant irrigation, and organisms of all kinds were found in the pus. One injection of *Bacillus massol* cleared up these organisms, and the urethral discharge ceased within forty-eight hours.

From Case 6 a pure culture of gonococci was isolated. He had a relapse when one month free from signs of the disease. By means of the urethroscope a small ulcer could be located 2½ in. from the meatus. No curative effect followed eight vaccinations at weekly intervals of a stock gonococcus vaccine containing from 5 to 50 million cocci. Late in the disease an injection of *B. acidi lactici* was tried as there was a Gram positive diplococcus in addition to the gonococcus found in the urethra; it had no influence on the course of the urethritis. Eventually, a cure was effected by silver nitrate applied to the ulcer by Guyon's syringe.

These cases are placed together to show the effect of combined irrigation, vaccine, and *B. acidi lactici*. They were on an average eighty-one days under treatment, the shortest was twenty-six days, and the longest 116. It seems as if the living bacillus has some influence in eliminating a septic infection complicating gonorrhœa. Further work is required on this point before a definite answer can be given.

Gonorrhœal Rheumatism.

Three patients were treated for this complication with vaccines. Two of them suffered from a relapse after vaccination, but were finally discharged from hospital quite cured.

Case 7 had urethritis with pain and swelling of both knees and the left shoulder. On the day following admission to hospital he had 50 millions of stock vaccine. His left knee became more swollen and painful. Five days later 10 million were injected without result. The third dose was 100 million, which caused some reaction for thirty-six hours. No irrigation had been tried up to this date, when 1 in 10,000 solution of permanganate of potassium was used to flush out the urethra morning and evening. A fourth injection of 150 million cleared up the joint pains, but slight swelling still remained. Five days later, 150 million were injected; this aggravated the urethral condition and caused the reappearance of pus with numerous organisms in the cells. The rheumatism disappeared on the twenty-

eighth day, and a final vaccination of 200 million gonococci produced no reaction. The urethral discharge and the threads in his urine disappeared on the next day, and did not recur.

Case 8 had been treated for two and a half months by ordinary methods without success, before coming under observation. In addition to urethritis he had both right and left ankles swollen, also the plantar fasciæ were very tender to touch. He received three injections, each containing 50 million cocci, with an interval of seven days between each injection. All signs of the disease disappeared on the fourteenth day after the first dose. However, in two months a relapse of the rheumatic pains and urethritis compelled this patient to return to hospital. At intervals of three days he had the following quantities of vaccine: 70 million, 20 million, and 30 million. On the seventh day of the relapse the urine became clear and he had no urethral discharge. The fourth injection, 40 million, was given on March 23, 1911, as a slight return of pus was found. As no active signs were present, and it was considered that there was no fear of affecting the urethra at this stage, a dose of 200 million was introduced under the skin of the shoulder, on March 30, 1911, in order to eradicate the rheumatism from his ankles. A marked urethral reaction followed in two days, a large amount of blood and pus also appeared; to control the former tannic acid bougies were necessary. However, the blood and pus cleared up in a week. Two further injections of 150 million on April 6 and 11 were not felt in any way by the patient, and he has not had a relapse of rheumatism for one year. He was in hospital thirty-three days, and free from disease in twenty-eight days.

The relapse in this case was due to insufficient dosage, and during the second admission time would appear to have been lost by giving the small and frequent rather than larger doses at longer intervals.

Case 9 was admitted to hospital with an uncomplicated attack of gonorrhœa on April 11, 1911. He had acute anterior and posterior urethritis. Three vaccinations each of 20 million were given with five days interval between them. At the same time irrigation with silver nitrate 1 in 10,000 was employed. No culture was obtainable, as the gonococci were few in number. On May 17, 1911, no signs of the disease were present and the patient was looked on as cured on May 27, 1911. Two months later, however, he was admitted to another hospital with subacute gonorrhœal rheumatism of both ankles, plantar fasciæ and shoulders. A vaccine

given and he was treated by other methods for some vith only partial success. In January, 1912, he was re- with the same condition of his ankles and plantar fasciæ . Bier's congestion treatment was tried by means of ands and hot air, but with little result. On February 2, c.c. of antigonococcal serum was introduced under the he abdomen as an experiment. The effect was most ed, for within forty-eight hours the patient could hop on ot without pain or discomfort, and has been well since that

Gonorrhœal Epididymitis.

10 had few gonococci in his urethra as in each of the pic fields of a smear of the pus only a few organisms were rrigation with 1 in 5,000 permanganate of potash was om the date of admission. Injections of 20 million "local" were given on April 30, 1911, and on May 3 and 11. The had ceased by the latter date and only a faint haze was the morning urine; 30 million were injected on May 17. orchitis supervened on the 19th. As the urine cleared a further dose of 30 million was tried; the reaction was nd a reappearance of pus from the urethra occurred. In six re was no further pain in the testicles. On June 13 both and testicles were normal, and no further evidence of ea has occurred.

his case vaccine treatment did not prevent the onset of tions, but that a curative influence was exercised on the f the disease is shown by the fact that twelve days from of onset of orchitis the urethra was clear and the pain and had gone from the testicles.

11. There was acute left epididymitis present on admis- hospital; the patient had been treated for gonorrhœa some previous to the present attack. Gonococci were very few oer. No culture was attempted. As a routine treatment fluid irrigation was employed, in a strength of 1 in 5,000. weekly injections, 20, 32 and 20 million respectively, of stock were administered; these succeeded in curing the nitis, and no further trouble has been noted, nor has a occurred.

ght testicular reaction followed the first dose, but the others t felt locally or gènerally.

Acute Cases.

These are divided into two groups. Nine were treated by a locally made stock vaccine and ten with a "manufacturer's" stock. Of the patients treated by the "local" stock, none had a higher dose than 50 million, the usual dose was 20 million, and the interval one week. The final dose in most of the cases was the largest, but the dose was not varied in a number of the cases, beginning at 20 million and ending with the same quantity. Reactions were avoided as far as possible and only occurred in two of the cases; 20 million appeared to be a medium initial quantity of vaccine, and the average case did not show signs of overdosage. Of course this definite statement only applies to this special vaccine, as it might be an excessive dose for a preparation made with a different technique, or with other strains of the organism. The gonococcus was isolated in pure culture from three cases of this series, and added to the stock emulsion.

The average number of days under treatment was 50·4. The shortest time was 19, and the longest 110 days, but this was an exceptional case which had a stricture in the anterior urethra, and was not in the least benefited by vaccine.

A few other cases may be quoted, first those whom immunization seemed to affect favourably, and also in whom no change could be imputed to vaccination, either for better or worse.

Case 12 was infected on April 24, 1911, and came under observation on May 7. Gonococci were few and cultivation was not successful. Irrigation with Condy's fluid 1 in 5,000 was begun on the first day. A dose of 20 million of a 10-valent vaccine was injected on May 10, 1911, and again on May 17, 1911, and was followed by rapid disappearance of both the discharge and the urinary deposit. There were no signs of gonorrhœa on May 22, 1911, and all treatment was discontinued on May 25, 1911. No relapse has occurred for nine months and no signs could be elicited on examination on March 1, 1912.

Case 13. This was his first attack. He became a hospital patient on February 26, 1911. Examination of the copious purulent discharge from the urethra showed a pure gonococcal infection to be present, very numerous organisms being found both free and in the cells. A culture on the special medium yielded a large growth; this was added to and formed part of the polyvalent vaccine. The urethra was flushed out thrice daily with permanganate solution until March 21; there was no discharge on that

date, though a haze could be seen in both the first and second parts of the morning urine. A dose of 20 million of the above-mentioned stock was given without reaction. Two days later a similar injection did not cause a negative phase, and in forty-eight hours the urine was clear. Irrigation was then stopped, and the patient left hospital on the thirty-first day. No relapse has since taken place.

Case 14. This case was a severe one. He was admitted with a urethral abscess, and a copious discharge containing a large number of gonococci; a pure culture of the organism was obtained on the first examination of the discharge. During the first month he had irrigation with potassium permanganate in very dilute solution owing to pain in the urethra. On March 16, 1911, 20 million gonococci were injected. There was no reaction. Four days later 12 million were injected, and three days later he received a dose of 16 million cocci. At the end of the three injections he still had a discharge containing gonococci. Owing to an anterior urethral stricture sounds were passed daily until Nos. 11 to 13 sounds could be introduced through the narrowed part. Three further doses of vaccine, each of 20 million, at weekly intervals, caused the disappearance of the gonococci from the urethra, and no discharge was to be seen. Four injections of 20 million, with seven days between each of them, completed the treatment.

In this case irrigations were continued throughout the time he had vaccines. Pain was not relieved by the treatment, it disappeared gradually, and the cessation did not seem to be connected with any particular dose of vaccine. Gonococci were found during the first two and a-half months of observation. Perhaps the dosage of the organism was insufficient, as no reaction occurred during the ten vaccinations. It did not appear advisable to give a larger dose owing to the acuteness of the symptoms for a long period.

Ten cases had injections of a stock made by one of the vaccine manufacturers. The quantity most usually employed was 50 million organisms, and varied from 5 to 50 million, the latter dose was not exceeded in the acute cases.

As with the preceding cases irrigation with permanganate of potash and silver nitrate was used in addition to the vaccine. A few typical cases are here quoted.

Case 15 had a copious discharge of pus from his urethra, numerous gonococci were found microscopically, both in the pus cells and free. Five million gonococci were injected the day following his admission into hospital. No reaction resulted. On January 9, 1911, 50 million were given; this was repeated on January

22 and 29. There was a distinct reaction after the last injection, with an increase of urethral discharge, which had previously been getting less. In a few days the condition cleared up very rapidly and no signs of the disease were present in the urethra or urine. The patient was permitted to leave hospital a week later. No relapse has since occurred. The duration of his stay in hospital was thirty-five days ; during the last week of this time he was apparently free from gonorrhœa.

In Case 16 gonococcus was the only organism present, but an attempt to grow it was a failure. Vaccination was carried out weekly. The first dose was 25 million, the second 50, the third was also 50 million, and no reaction occurred after any of these, but at the same time there was no appreciable change in the number of gonococci or in the amount of his urethral discharge. The fourth injection was reduced to 20 million; both gonococci and discharge diminished in the course of a week. The disease became quiescent and it was thought that a cure had been brought about. However, in a week both gonococci and discharge reappeared and vaccines were resumed. Two doses, 50 million in each, were given with an interval of a fortnight. No further recurrence has taken place for a year. This case had no other treatment but the stock vaccine. He was under treatment for exactly two months. The next case was treated in a similar manner, inoculation alone being used.

Case 17. When admitted on November 12, 1910, the urine contained much mucus and many threads. Gonococci were found scantily in the threads, but cultivation of the organism was unsuccessful. Urethroscopic examination revealed a granular and swollen state of the whole urethra, as far as could be seen by means of Casper's instrument.

On November 29, 1910, he was injected with a dose of 5 million stock vaccine. There was no reaction. At weekly intervals three doses each of 50 million gonococci were given, and on December 20, 1910, neither urethral discharge nor Thompson's "two glass" test showed any evidence of gonorrhœa. A final dose of 25 million on January 2, 1911, completed the treatment. This case was in hospital for fifty-three days; he was clear of signs in forty days. No other form of treatment was employed in this case, and no relapse has occurred in twelve months.

The other cases do not present points of any special interest. The accompanying table shows the results of this form of treatment.

	Acute Gonorrhœa.	
	No. of cases	Average No. of days in hospital.
Manufacturers' vaccine	10	48·9
Local stock vaccine	9	50·4

For at least one week of this time in hospital there were no signs of disease, as tests were carried out to prove that the gonorrhœa had ceased. By acute gonorrhœa is meant those cases which were treated from the time the men themselves noticed a discharge from the urethra. It is unusual for these men to suffer pain or scalding in the earliest stage of the disease, hence they do not come under treatment till there is a thick yellow discharge of pus from the urethra.

Although these thirty cases were in hospital more than the average time, relapses were below the average, and were quickly amenable to the treatment.

Whether dosage can be laid down is doubtful, for some men could tolerate larger doses of vaccine than others. No true anaphylactic symptoms due to the gonococcus occurred. In some cases a negative phase was observed, but this was due to an overdose.

As in other vaccines too small a dose is to be avoided for it would appear that immunity against the vaccine is the only result, *vide* Case 14.

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SOME REMARKS ON A CRITICISM OF QUININE INJECTION AND TETANUS.

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In the Journal of the Royal Army Medical Corps for April, 1912, an article by Major F. J. Palmer, R.A.M.C., appeared under the heading "Quinine Injection and Tetanus: A Criticism," in which the author ventured to find fault with some experiments carried out by me with the object of throwing some light on the subject of "The Relation of Tetanus to the Hypodermic or Intramuscular Injection of Quinine."

A detailed account of the experiments which I carried out when investigating this subject, and including those which Major Palmer criticizes, will be found in "No. 43 of the Scientific Memoirs by Officers of the Medical and Sanitary Departments of the Government of India." It is not my intention in this article to enter into a discussion of the many points already clearly dealt with by me in my Scientific Memoir. I shall merely deal with a few of the many errors into which Major Palmer has fallen in his criticism.

In the opening paragraphs of his article Major Palmer makes the following statement: "In consequence of the conclusions formed by Lieutenant-Colonel Semple, the intravenous injection of quinine is recommended instead of the intramuscular, but the objections to the intravenous route are many and serious, and it is doubtful whether it will ever seriously take the place of the intramuscular method as a popular means of exhibition."

With the latter half of this quotation I have no fault to find, but on the contrary I would like to add, that in my opinion, neither the hypodermic nor intravenous methods of giving quinine are ever likely to become popular means of exhibition.

I am not aware that I have ever advocated the intravenous administration of quinine to take the place of the intramuscular, and I do not think any of the experiments carried out by me, or the conclusions drawn from them, would encourage anyone else to do so.

It would appear from various remarks in Major Palmer's article that he has a grievance against a particular circular to which he refers, and that he believes this circular is based on the results of my experiments. I have never seen the circular in question, and I know nothing of its contents, except that I have heard one

or two medical officers in India mention that the intramuscular injection of quinine was prohibited in the Army in India owing to cases of tetanus supervening.

As I have already said in my Scientific Memoir, No. 43, p. 59, and in the *Indian Medical Gazette*, for December, 1911, p. 454, I should certainly not recommend anyone to withhold a hypodermic injection of quinine from any case where it was indicated; but, on the other hand, I should be very sorry to recommend this method of giving quinine as a routine measure in all cases. I should confine myself to the exceptional cases in which quinine by this method is indicated, and these I should safeguard by a dose of tetanus antitoxin, especially in those localities of tropical countries where tetanus frequently occurs.

The next point touched on by Major Palmer, and relevant to the subject which he criticizes, is the following :—

"Semple later states that eleven cases of tetanus following quinine injection were brought to his notice, and mentions that in one case he cultivated the tetanus bacillus from the distilled water in which the quinine had been dissolved. The number of cases in which tetanus has possibly occurred from latent infection can thus be reduced to ten. Ten cases occurring in the whole of India and spread over a series of years!"

It would appear from this quotation that Major Palmer assumes that only ten cases occurred in the whole of India. There may have been 110, or even more for anything I know to the contrary. I have certain knowledge of ten cases, but as I said in my Scientific Memoir, p. 3, many hearsay records might be mentioned in which tetanus is said to have followed the hypodermic administration of quinine, and no doubt many of these are authentic, but in the absence of sufficient authority to vouch for their accuracy, one would not be justified in treating information of this kind with the respect due to established facts.

In some of the French Colonies there have been several cases of tetanus following quinine injections. I do not think medical men are in a hurry to publish cases of tetanus following the hypodermic injection of quinine or any other operations. The fact that it is possible to bring about the death of a patient by using a remedy intended to cure, is quite sufficient to stimulate medical men to leave no stone unturned to avoid calamities of this kind. In the words of the late Professor Maclean, "there is something revolting in a death brought about directly or indirectly by a remedy intended to cure." These were Maclean's remarks many

years ago when reflecting on six cases of tetanus in India following quinine injections, the details of which had been brought to his notice.

The other points worthy of notice are those in which Major Palmer criticizes some of the tables of experiments given in my Scientific Memoir, and on reading over his comments I was convinced that he had failed to grasp the meaning of the experiments he attempted to criticize, or even the object for which a particular series was carried out.

TABLE IV.—EXPERIMENTS ON GUINEA-PIGS TO PROVE THE INFLUENCE OF QUININE IN PRODUCING FAVOURABLE CONDITIONS FOR TETANUS INFECTION WHEN QUININE IS COMMENCED ONE DAY BEFORE "WASHED TETANUS SPORES" ARE GIVEN.

Number of experiment	Date of injection of spores	Date of injection of quinine	Amount of quinine injected	Result	Remarks
1	August 27, 1910, right *hind leg*	August 26 to 28	½ gr. daily for two days on front of *chest*	Tetanus, September 3. Died, September 6.	Disease local at first, then became general. Tetanus bacilli grew in anaerobic cultivations made from site of injection of spores, and from site of injection of quinine, but not from the liver, or spleen
2	Ditto	Ditto	Ditto	Tetanus, September 2; remained chronic for five weeks, then recovered	Disease localized to the right leg and right side of body; very severe for a week, when daily improvement set in
3	Ditto	Ditto	Ditto	Remained well	—
4	Ditto	Ditto	Ditto	Ditto	—
5 (Control of spores)	Ditto	*Nil*	*Nil*	Ditto	—
6 (Control of culture from which spores were prepared.)	½ c.c. culture, right *hind leg*	*Nil*	*Nil*	Tetanus, August 28. Died, August 30	Local at outset, then became general

This Table shows 50 per cent of infections when quinine is given one day before spores; the quinine was injected on front of the chest, and spores in the hind leg.

As proof of this statement I shall deal with his remarks on the experiments given in Tables IV, VII, VIII, XII and XV in Chapter V of my Scientific Memoir. Other examples might also be given, including his assumption that weight for weight guinea-pigs and man are equally susceptible to quinine, when it is now

well known that these small animals are far more tolerant of quinine than man. The examples I have chosen will suffice to show that Major Palmer could not have carefully read over my Memoir, and that he failed to grasp the meaning of the experiments therein recorded.

To make matters as clear as possible it is necessary to give each of the above mentioned tables separately, together with Major Palmer's criticisms on them and my remarks, so I shall deal with the subject in the order mentioned.

Major Palmer's Criticism on Table IV.

"A dose of quinine equivalent to 64 gr. in man was given before an injection of spores. This was followed by daily injections of quinine equivalent to 64 gr. Two out of four animals developed tetanus. In this case one of the two control animals also developed tetanus, though no quinine had been given; there were thus 50 per cent of infections in both the experimental and control animals, and the result of this experiment is valueless, except to show that the injection of washed spores is not always the harmless procedure Semple would have us believe, and that, as 50 per cent of this series of animals injected with spores but no quinine developed tetanus, a liberal discount must be made for the effect of quinine in some of the cases in which both quinine and spores had been given."

It would appear from this comment that Major Palmer was under the impression that both control animals received "washed tetanus spores," whereas only one received "washed tetanus spores," and was a control on the spores used in experiments 1, 2, 3 and 4; the other control animal received a sample of the culture from which the spores used in the other experiments in this Table had been prepared, and was a control to prove that this culture was virulent, and being a virulent culture of course the animal was bound to contract tetanus. Neither of the control animals received any quinine, a fact which Major Palmer notes correctly.

These experiments show:—

(1) That of four guinea-pigs which received hypodermic injections of quinine in front of the chest, and "washed tetanus spores" in the hind leg, two developed tetanus.

(2) That "washed tetanus spores" alone do not cause tetanus in guinea-pigs.

(3) That the culture of tetanus from which the "washed spores" were prepared was virulent.

vill be seen that this is a different interpretation to what Palmer puts on this series of experiments. To anyone .ted with the meaning of experiments with tetanus, the have noted become apparent on glancing at the table.

–THE RESULTS OF THIS SERIES OF EXPERIMENTS ON GUINEA-PIGS ARE GIVEN USTRATION OF THE IMPORTANCE OF USING PURE CULTURES ONLY WHEN EXPERI- WITH "WASHED TETANUS SPORES," AND THE NECESSITY FOR CONTROL EX- ;. THE CULTURE USED HAD GOT ACCIDENTALLY CONTAMINATED WITH ANOTHER :MING BACILLUS.

Date of injection of spores	Date of injection of quinine	Quantity of quinine injected	Results	Remarks
ebruary 25, 1910	February 23 to 25	½ gr. daily for two days	Tetanus, February 26. Died February 27	This series proves nothing so far as quinine is concerned, owing to the fact that the two controls contracted tetanus. In all seven experiments there was local swelling at the seat of injection of spores, and bacilli resembling malignant œdema present in stained specimens. Both these and tetanus bacilli were isolated by cultivations from two cases (one control and one experiment)
Ditto	Ditto	Ditto	Ditto	—
Ditto	Ditto	Ditto	Ditto	--
Ditto	Ditto	Ditto	Ditto	—
ebruary 25, 1910	*Nil*	*Nil*	Ditto	Both controls contracted tetanus, which rendered the series of experiments useless
c.c. tetanus culture, February 25, 1910.	*Nil*	*Nil*	Ditto	Symptoms very acute, and disease proved rapidly fatal

on made from the spores used for this series after heating for five minutes at a f 75° C. grew a mixture of tetanus and other spore-forming bacilli. The series anus spores mixed with other spores produce tetanus.

MAJOR PALMER'S CRITICISMS ON TABLE VII.

he seventh series of experiments proves nothing that the tor desires, but goes far to vitiate most of his other experi- as the two controls developed tetanus at the same time.

This, again, shows that the injection of washed spores is not always as harmless as the author would have us believe. In this connexion refer also to Table IV, where half the controls developed tetanus."

In my Scientific Memoir I mentioned that owing to an accidental contamination by another spore-bearing germ of the culture from which the "washed tetanus spores" had been prepared, this series proved nothing as far as quinine was concerned, as the two control animals contracted tetanus at the same time as the four experimental ones. I merely gave the series as an illustration of the necessity of using pure "washed spores," and the importance of never omitting control experiments.

It also served as an example of the fact that "washed tetanus spores" when mixed with a contamination produce tetanus when pure "washed spores" would fail to do so, as proved by the numerous control experiments in my Memoir, in which only pure "washed tetanus spores" prepared from virulent cultures were given, and with the result that the animals invariably remained well.

Major Palmer's Criticisms on Table VIII.

"A tetanus culture and not spores was used upon this occasion. A quarter of a cubic centimetre was given, and, when local tetanus was marked, six of the animals were injected with ½ gr. quinine (equivalent to 64 gr. in man). All died. A control animal to which no quinine had been given also died the same day. In five out of six cases a culture was made from the site of injection, but bacilli were not recovered from the blood. Comment is needless here. One does not give large doses of quinine when tetanus is present. Note also that the control died."

The object of this series of experiments is given in the heading for the Table in which they are recorded, viz., to prove whether hypodermic injections of quinine in cases of tetanus infection produce local conditions suitable for the growth of tetanus bacilli, and the results recorded in the Table clearly prove that this is the case. Of course all the animals in the series died, including the control, as all had been inoculated with a living virulent culture of tetanus.

The important point demonstrated by the result of this series of experiments is the fact that in five out of six cases in which quinine was given hypodermically to animals in the early stage of tetanus, a culture of tetanus was obtained after death from the site of

injection of the quinine, although the quinine had been injected on the front of the chest, and the tetanus infection in the hind leg. Similar results will be found recorded in Tables IX and XII of my Scientific Memoir. In 1904, Vincent, of the Pasteur Institute, Paris, when experimenting with quinine and tetanus infections, also obtained results which favour the view that quinine injections produce foci favourable for the growth of tetanus bacilli, and that infection may be conveyed from the original site of the disease to these foci.

TABLE VIII.—EXPERIMENTS ON GUINEA-PIGS TO PROVE WHETHER HYPODERMIC INJECTIONS OF QUININE IN CASES OF TETANUS INFECTION PRODUCE LOCAL CONDITIONS SUITABLE FOR THE GROWTH OF TETANUS BACILLI.

Number of experiment	Date and seat of injection of tetanus *culture*	Date and seat of injection of quinine	Result	Result of Anaerobic Cultivations made after Death from		Remarks
				Seat of injection of tetanus culture	Seat of injection of quinine	
1	August 25, 1910, right *hind leg*	August 27, 1910, ½ gr., *chest*	Tetanus, August 27. Died, August 29	Growth of tetanus bacilli	Growth of tetanus bacilli	Tetanus local at first; then became severe and general after quinine was given. Infection was conveyed from the hind leg to seat of quinine injection on front of chest
2	Ditto	Ditto	Ditto	Ditto	Ditto	Ditto
3	Ditto	Ditto	Ditto	Ditto	Ditto	Ditto
4	Ditto	Ditto	Ditto	Ditto	Ditto	Ditto
5	Ditto	Ditto	Ditto	Ditto	Ditto	Ditto
6	Ditto	Ditto	Ditto	Ditto	No growth of tetanus bacilli	Symptoms same as experiments Nos. 1 to 5
7 (Control of tetanus culture used)	Ditto	*Nil*	Ditto	Ditto	—	Tetanus local at outset; then became general

In all these experiments the tetanus bacillus was recovered from the seat of injection of culture (hind leg) and in five out of the six cases in which quinine was given, tetanus bacilli were also isolated from the seat of injection of the quinine (chest). The failure to isolate tetanus bacilli from the seat of quinine injection in No. 6 experiment was very probably due to the fact that a hot glass rod was accidentally used to push down into a broth tube the small piece of subcutaneous tissue used to inseminate it. The tetanus bacilli isolated from the seat of injection of quinine were virulent for guinea-pigs.

In all the animals a culture of tetanus was obtained from the seat of injection of the tetanus culture used.

In my Scientific Memoir, pages 39 and 40, I made the following comments on this series of experiments.

In five out of six experiments, infection was conveyed from the original site of infection in the leg to the site of quinine injection on the front of chest. When these results are interpreted, it means that quinine given hypodermically in the early stages of a tetanus infection starts a fresh focus of infection, and a focus from which tetanus bacilli (which have not been injected into it) can be isolated.

The question arises, how did infection get conveyed from the leg to the chest in these cases? One can only surmise that early in tetanus infection the efficiency of the phagocytes is severely taxed, and that some of them re-enter the circulation carrying tetanus spores, and before they have been able to deal successfully with these spores, they get stranded at the site where quinine has been injected, where they find dead tissue under anærobic conditions, the most suitable conditions for the germination of tetanus spores. A spore-infected phagocyte entering the circulation would not be likely to get stranded in healthy living tissue, and if it did, it would not find conditions suitable for the spores to develop, and its phagocytic action would not be interfered with.

As evidence in favour of this might be adduced the fact that after death in cases of tetanus the bacilli are not found in anærobic cultivations made from the internal organs or heart's blood. If Major Palmer had read my Scientific Memoir carefully, he would have seen that in Tables IX, X, XII and XIV, in addition to other results, ample proof is given, that in cases of tetanus the causal organism is not found in the internal organs and blood after death. An exception would have to be made in regard to an internal organ in the case of "visceral tetanus," for the causal organism would be present in the internal organ where the disease originated.

Major Palmer's Criticisms on Table XII.

"In Table XII three monkeys of weights 12 to 14 lb. were injected at two different sites with 4 grs. of quinine (equivalent to 64 gr. in a man) on three successive days. All developed tetanus, and the bacillus was recovered from the site of injection, but cultures made from the blood proved negative. The site of injection of the spores is not mentioned. This is obviously a matter of

TABLE XII.—EXPERIMENT ON MONKEYS WITH "WASHED TETANUS SPORES" AND QUININE.

Number of experiment	Date and seat of injection of ½ c.c. spores	Date and seat of injection of quinine	Result	Result of Anærobic Cultivations made from: Seat of injection of spores	Seat of injection of quinine	Liver	Spleen	Remarks
1	September 2, 1910, right *hind leg*	September 2, 1910, 3 gr., *chest*. September 3, 4 gr., *chest*. September 8, 4 gr., *chest*	Tetanus, September 19. Died, September 26	Growth of tetanus bacilli	Growth of tetanus bacilli	*Nil*	*Nil*	Quinine commenced same day as spores. Lockjaw an early symptom, followed by stiffness of neck and shoulder muscles, and difficulty in swallowing
2	September 2, 1910, right *hind leg*	September 3, 1910, 4 gr., *chest*. September 4, 4 gr., *chest*. September 8, 4 gr., *chest*	Tetanus, September 17. Died, September 20	Growth of tetanus bacilli	Growth of tetanus bacilli	*Nil*	*Nil*	Quinine commenced one day after spores. Lockjaw an early symptom, and soon after tetanus became general and very acute
3	September 3, 1910, right *hind leg*	September 2, 1910, 3 gr., *chest*. September 3, 4 gr., *chest*. September 8, 4 gr., *chest*	Tetanus, September 15. Died, September 21	Growth of tetanus bacilli	Growth of tetanus bacilli	*Nil*	*Nil*	Quinine commenced one day before spores. Lockjaw an early symptom, then slow general tetanus set in, finishing up with emprosthotonos
4 (Control of spores used)	September 2, 1910, right *hind leg*	..	Remained well	—	—	—	—	—
5 (Control of tetanus culture used to prepare spores)	September 2, 1910, 1 c.c. tetanus culture, right *hind leg*	..	Tetanus, September 4, Died September 5	Growth of tetanus bacilli	—	*Nil*	*Nil*	Lockjaw an early and prominent symptom. Opisthotonos marked before death

In No. 1 experiment, immediately after death, a guinea-pig was injected subcutaneously with 3 c.c. of blood taken from the heart, but the animal did not contract tetanus. An anærobic cultivation made from ½ c.c. of the heart's blood transferred to a broth tube also gave negative results.

It is evident from the results of the experiments recorded in this Table, that quinine, when given hypodermically to monkeys, produces conditions in which pure "washed tetanus spores" become infective, and capable of producing fatal tetanus. It will be observed that lockjaw was an early and prominent symptom in all four cases, and that opisthotonos was present in one case, and emprosthotonos in another.

extreme importance, as it makes all the difference whether the spores were injected at the same spot as the quinine or at a distance. Note also that as the blood cultures were negative, there could not have been a large number of spores or bacilli in the blood to be carried into a distant focus, and there find a nidus for development."

TABLE XV.—EXPERIMENTS PROVING THE PRESENCE OF TETANUS GERMS IN NORMAL HUMAN FÆCES.

Number of experiment	Preparation of material used	Cultivation used	Result	Remarks
1	Emulsion of normal fæces in normal saline solution and heated 5 minutes at 80° C.	Anærobic broth culture	Growth of tetanus bacilli	In the four specimens which contained true tetanus bacilli, there were also other spore-forming bacilli, including the pseudo-tetanus bacilli described by Tavel and Zimmerman, but these were easily distinguished from the true form. Four out of the six negative specimens contained pseudo-tetanus bacilli, and other spore-forming germs; numerous spore-forming bacilli with no resemblance to either the true or pseudo-tetanus bacillus were found in the remaining two specimens.
2	Ditto	Ditto	Ditto	
3	Ditto	Ditto	Negative	
4	Ditto	Ditto	Ditto	
5	Ditto	Ditto	Ditto	
6	Ditto	Ditto	Growth of tetanus bacilli	
7	Ditto	Ditto	Negative	In experiments Nos. *1, 6 and 9* the tetanus bacilli isolated *were virulent for guinea pigs in small doses.*
8	Ditto	Ditto	Ditto	
9	Ditto	Ditto	Growth of tetanus bacilli	In experiment No. 2 the tetanus bacilli isolated were non-virulent for guinea pigs in a dose of 1 c.c. of a 14 days' culture.
10	Ditto	Ditto	Negative	

The experiments in this Table prove that a large percentage of normal healthy persons harbour virulent tetanus bacilli in their intestinal tracts (4 out of 10, or 40 per cent).

In my descriptions of this series of experiments it is clearly and definitely stated that the spores were injected in the right hind leg, and the quinine on front of the chest; and besides, a reference to the Table will make it plain that the sites of injection of quinine and spores are given under two separate headings. The blood from only one of these experiments (No. 1), was used for No. 3 experiment in Table XIV.

Surely Major Palmer must have only glanced at this Series of experiments, otherwise it is impossible to believe that he could have dropped into such glaring inaccuracies.

MAJOR PALMER'S CRITICISMS ON TABLE XV.

"Cultures made from the fæces of ten guinea-pigs proved positive in four cases. In three of these the bacillus was of a virulent type, and in one non-virulent. This experiment has an important bearing on the next series."

Here again Major Palmer must have only glanced at this series of experiments, for it refers to cultivations made from the intestinal contents of ten healthy human beings (and not from guinea-pigs), in which four out of the ten examined gave a growth of tetanus bacilli. Major Palmer, however, correctly remarks that three of the cultures were virulent, and one was non-virulent.

Other examples might be given, such as the criticism of Table XIV., in which Major Palmer states that "the heart blood of three of the animals mentioned in Series XII. was examined with a negative result." As a matter of fact Table XIV. records experiments with blood taken from the hearts of two guinea-pigs and a monkey, and Table XII. records experiments with tetanus spores and quinine on three monkeys and two control monkeys. It is true that the blood from one of these experimental monkeys was used for one of the experiments in Table XIV.

I might further add to the list of errors into which Major Palmer has fallen in his attempt to criticize my memoir, but the few points I have touched upon will suffice.

STAFF TOURS.

Syllabus for an Appreciation.

BY MAJOR S. H. FAIRRIE.
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THE following syllabus has been compiled from notes which the writer made for his own use in working out medical schemes, as he found that a medical appreciation and scheme could not be fully worked out and put together unless some such syllabus as now presented was first prepared.

The syllabus has been made as complete as possible, but it should be clearly understood that it may not be necessary to include or discuss all the items in any one appreciation. Military situations vary so much that an item which may be important in one scheme may be left out in another. But there is one item which must always be fully dealt with, and that is the provision of transport for sick and wounded. Without transport there can be no evacuation of wounded. The medical service in war is based on the evacuation of sick and wounded. The merits of any medical scheme, therefore, should be mainly judged by the efficiency of the proposed transport arrangements. Unfortunately the provision of evacuation transport for sick and wounded is not a medical service, but it is the medical officer's duty to calculate the amount of transport required, and to ask for it.

This particular syllabus in its entirety is applicable to an appreciation by the D.M.S. of a field force, who is preparing his complete report and scheme for submission to the C.-in-C. It is also suitable for the A.D.M.S. of a division acting independently, who would be his own D.M.S. and D.D.M.S.

Parts I and II of the scheme on distribution and evacuation are the particular parts which would have to be elaborated and carried out by the D.D.M.S.

In writing an appreciation it should be remembered that the information and proposals are for submission to the G.O.C. and not to higher medical authority.

The D.M.S. should give in Parts I and II of the scheme sufficient detail to indicate to the C.-in-C. the lines of action he intends to set the D.D.M.S. and others to follow out and elaborate. The D.M.S. is the responsible individual who has to bear the brunt of everything that goes wrong in the medical arrangements of a field force.

The references to the military situation should be very brief. Full information on this point is always provided in the general and special idea, supplemented by a narrative of events and copies of operation orders issued, if the scheme set is a partly developed one.

Appreciations will vary somewhat according to the time and stage in the scheme of operations at which they are called for. In all appreciations certain assumptions will be necessary, in order to obtain a starting point for the scheme of medical arrangements. None of the assumptions made should include anything which the writer, in whatever capacity he is writing, should himself propose or arrange.

What should be avoided? Writing as D.M.S., except when A.D.M.S. of a division acting independently, avoid any reference in detail to arrangements which would be made by the A.D.M.S. of divisions; and writing as either D.M.S. or A.D.M.S., avoid referring to matters which are the sole concern of the O.C. of the field ambulance, or of the M.O. in charge of a regiment. Avoid proposals and arrangements which are not orthodox; also complicated schemes or proposals which will certainly break down in practice or which cannot be carried out with existing means. All such would be promptly vetoed by any G.O.C. in actual war.

In reference to para. 9 of "situation," the training and discipline of the fighting troops may have a medical significance. For instance, a force composed wholly or in part of troops partly trained and disciplined would seriously complicate sanitary matters and be likely to cause a marked predisposition to preventable disease.

As regards para. 11, the Red Cross Society cannot at present do very much under the sub-heading (ii), beyond the organization of a proportion of the Voluntary Aid Detachments.

To pass to the scheme of medical arrangements.

Para. 3. A forecast of expected fighting is a purely military question and should not technically be required from the medical service. It should be appended to the special idea by the general staff officer who draws up the scheme. However, this is very seldom done, never on mixed staff tours, since it is part of the problem set for the combatant officers. Usually a trifling calculation in time and space will provide an answer to this. Such a forecast must always be given if not provided, as it is the pivot of the immediate medical arrangements.

Part I. Distribution. In considering the disposal of the sick and wounded: Having estimated the numbers to be dealt with in each of the three zones, the preparation of the scheme will be greatly facilitated by commencing with the distribution.

Para. 7. Definite and complete arrangements under this head will always be necessary. It was found in S. Africa, and is always apparent in working out plans at staff tours, that great confusion arises when large bodies of sick and wounded arrive at the base. To obviate this some official with a staff and a sufficient number of assistants must be appointed, whose duty it will be to receive, sort, and distribute the wounded in batches to the various general hospitals, according to their vacant accommodation, and to arrange for transport. It might be necessary to create a large rest station to provide for those whom it may be necessary to send further on. To work out proper arrangements for this purpose makes a most suitable exercise, therefore only the general features have been noted.

Sanitary arrangements at the base, arrangements for the base depot of medical stores and for medical supply in general, for a reserve of material, and for laboratories, although important, need hardly be included in an appreciation for the C.-in-C.

As regards Part II, Evacuation :—

Para. 10. Under this full consideration will have to be given to the recent changes in the method of supply adopted for the expeditionary force and to the fact that similar arrangements would certainly be made for the supply of a force, whether regular or territorial, operating against an enemy in home territory. An excellent account of these changes is to be found in Article XVII, *Army Review*, July, 1911, by Colonel Paul, C.M.G. But it must always be remembered that the regular transport for supply may suffice for the evacuation of the daily sick or for the wounded after some insignificant skirmish, but to evacuate the wounded during and after any serious engagement the provision of extra transport becomes an absolute necessity.

Para. 14 and 15. The clearing hospital is perhaps the most useful and important unit in the whole scheme for medical service in the field. Although not a mobile unit, it is supposed to be a unit able and prepared to move at a few hours' notice. It is not a hospital in the true sense of the word, but an evacuating unit. Its work will be entirely that of sorting and passing on sick and wounded. Under existing arrangements it has no means of transporting itself, let alone sick and wounded. The transport

requirements of the clearing hospital are therefore very much the concern of the medical service and should receive full and particular attention, as on its sufficiency and efficiency the whole scheme for evacuating sick and wounded from an army in the field will depend.

The writer favours the formation of an auxiliary transport company of the requisite number of motor omnibuses, a number sufficient to carry in one journey all the wounded who will require evacuation, calculating the casualties at 5 per cent of the force. The carrying capacity and method of fitting up these vehicles is now given in R.A.M.C. training.

The task of putting each clearing hospital into a condition to fulfil its functions is that of the D.D.M.S., who requisitions for what is required on the I.G.C. and Director of Transport. It must never be forgotten that all and every failure in the measures for the evacuation of wounded after an engagement will have to be borne by the medical service. This is the reason why the writer makes a point of giving it full consideration in an appreciation for the C.-in-C. If the proposals there made were sanctioned the hands of the D.D.M.S. would be immensely strengthened in insisting that the needs of the situation are fully met by the I.G.C.

It should be remembered that if the force includes or is formed from Territorial troops, the function of a clearing hospital has to be improvised from local voluntary aid detachments and that the scheme may have to include this.

As regards the later part of para. 14: It should be laid down that some well-defined spot must be fixed for the clearing hospital to take over sick and wounded from the field ambulances, otherwise a hiatus will occur in the line of evacuation. The divisional collecting station being the rearmost and first formed medical post —notified to the troops in operation orders, and at which it is laid down improvised transport may be assembled and prepared— would naturally be the most suitable point to be fixed upon for this purpose. If, however, this point be not so used, then another post with another name must be created, to fulfil the purpose of this link. Provision for the rapid, easy and uninterrupted flow of wounded from the field ambulances to the clearing hospital is far too important to be left to chance, and should be carefully worked out in any scheme by those responsible for it.

Para. 18: The work of the Sanitary Inspection Committee as defined in F. S. Regs., chapter x, para. 73, may receive consideration if the situation requires it.

If in the appreciation there arises any question upon which no information has been supplied, and upon which information is necessary, the exact steps to be taken to obtain it should be stated.

Paragraphs should be numbered and their subject matter inserted as a marginal note.

In concluding these notes and explanations I have to acknowledge valuable suggestions from other officers both as regards additions and omissions in the syllabus, with a view to making it more generally applicable, especially from the point of view of beginners at this class of work.

Syllabus for an Appreciation—from the Point of View of the Director of Medical Services.

(1) *Heading.*—The particular tour, date of same, and the name of the writer.

* * * * * *

(2) *Title.*—Appreciation at . . . (the time), on . . . (the date), by the Director of Medical Services with Headquarters of . . . (the force) at . . . (the place).

(3) *Maps.*—Reference . . . (any particular map or maps).

I.—The Military Situation.

(1) *Situation.*—Give only such references and explanations as will render your appreciation connected and intelligible, and show that you have grasped the situation. Mention here whether either of the countries at war is not civilized, and if they are signatories of the Geneva Convention, 1906.

(2) *Assumptions allowed.*—State any military assumptions necessary or justifiable, such as: Mobilization ordered, calling out the reserves, embodiment of the Territorial Forces, &c., &c.

(3) *Strength of Forces, Position of same.*—Give the strength of the forces engaged, giving only sufficient detail to show how the numbers have been arrived at. State the position of these forces at the time of writing.

(II) The Medical Situation.

(4) *Character of Country, Climate.*—The geology, physical geography and topography of the country. The climate and the season.

(5) *Population, Towns.*—The population, if friendly or otherwise, towns, villages, farms? Buildings available in towns, &c., for

medical purposes? Their distances from the scene of operations? Note any places suitable for any particular medical purposes, and what places may not be available or would not be suitable. Mention any local epidemic or endemic disease or diseases by which the civil population are afflicted or liable to, and which might extend to the troops. (Any precautions under this head should be included in your sanitary measures and precautions, *see* para. 18 of the Medical Scheme.)

(6) *Water.*—Water supply? Source and quality generally.

(7) *Supplies.*—What medical supplies may be available in the locality? This would be an important point for a force besieged or likely to be.

(8) *Communications:*—

(*a*) *Facilities for Transport.*—By road: Gradients, character, numbers of and direction of the roads, whether metalled or not, broad or narrow, straight or winding, if suitable for carts, carriages or motor cars; fords, ferries, bridges? By water: Rivers, canals or lakes; boats available? By rail: Stations on lines of railway, facilities for entraining and detraining wounded; rolling stock available for sick transport? In all, the facilities for the formation of rest and refreshment stations should be mentioned.

(*b*) *Transport.*—Any local transport likely to be available to supplement the established transport. If ascertainable, give number and character of vehicles, horses, drivers; motor cars, their kind and if suitable for transport of sick and wounded and medical supplies? The localities of these should be given.

(*c*) *Facilities for Messages.*—Post offices and postal telegraph? Telephone service?

(9) *The Troops.*—The training of the medical units? Their equipment? The efficiency and sufficiency of the regulation transport provided on mobilization for the medical units? Refer specially to that for the clearing hospitals.

(10) *List of Medical Units.*—Give a list of the medical units available on mobilization? Their place of assembly if known, unless this has already been stated in the situation.

(11) *Medical Arrangements made.*—State the arrangements which it may be assumed have been made up to the time of the appreciation: (i) By the War Office or other central authority. (ii) by the Red Cross Society.

Under (i) such items as: General Hospitals, Territorial Force mobilized; Home Hospitals, Reserve called out; the expansion of existing military hospitals and their clearing of sick and unfits by

dispersion to their homes or to more distant military hospitals; estimate the number of beds that may be available under this heading. State what hospitals you would expect to be told by the Central Authority to be available on mobilization for this particular field force. Any arrangements to supplement the above which the War Office could alone make and which you would expect to be made, to meet the situation.

Under (ii) would be included: Supplementary hospitals; convoys of evacuation; personnel and material for rest and refreshment stations; schemes for auxiliary transport. State what Voluntary Aid Detachments you would expect to be allotted or to find available.

* * * * * *

Having now discussed all the points in the military and medical situation, with which the D.M.S. must make himself thoroughly acquainted, you should now proceed to draw up a scheme of the medical arrangements for the approval of the C.-in-C.

* * * * * *

Scheme of Medical Arrangements.

(1) *Preliminary Arrangements.*—Arrangements for the sick of the force during strategical concentration. Estimation of the numbers which will have to be disposed of. What buildings you would appropriate for use as hospitals (see Field Service Regs., Part II., para. 26 (6))? Personnel and material for the same.

(2) *Sick.*—Estimation of sick for the first week of the advance.

(3) *Expected Fighting—Casualties.*—Locality and date of first fighting expected. Numbers of casualties to be expected, classified as: Killed; unfit for transport; lying-down cases; sitting-up cases; able to walk; total.

(I) Distribution.

(4) *Base Hospitals.*—Numbers, actual or proposed; localities, accommodation of the various general hospitals? Their distances from the advanced base, if the latter is fixed? Give the total number of sick and wounded for distribution, as estimated.

(5) *Convalescent Depots.*—How formed and where?

(6) *Infectious Hospitals.*—How formed and where?

(7) *Transport to the Base Hospitals.*—Details of your method of distribution and transport of sick and wounded from the base railway station to the various base hospitals? What official would have charge of this duty, and what arrangements would he be

instructed to make? Give also the detail of any sick convoy arrangements which might be necessary.

(8) *Hospital Ships.*—Detail of hospital ships, if the scheme requires this method of transport.

(9) *Reserves.*—If the scheme requires it give the arrangements for reserve of personnel? Reserve hospitals? Reserve field ambulances?

(II) EVACUATION.

(Only such of these headings as apply to the scheme should be included.)

(10) *Lines of Communication.*—Localities of base and railway regulating centre? Railhead? Line adopted for supply by the I.G.C., if known? If this corresponds with the line of evacuation for wounded and if you expect or require the returning empty wagons or lorries to assist in the evacuation of wounded. If so the steps you would take to ensure their being available.

(11) *Line of Evacuation—Rest Posts.*—Your proposed line of evacuation for sick and wounded? Localities of posts proposed for rest and refreshment stations? How personnel is to be provided?

(12) *Hospitals on Lines of Communication.*—Proposed situations for any hospitals or convalescent depots on the Lines of Communication? Whether regular units or improvised; if the latter, how organized, maintained and manned?

(13) *Transport for Evacuation.*—Give the total numbers of sick and wounded who are likely to need evacuation. Proposed evacuation arrangements down Lines of Communication from the advanced base or railhead to the base hospitals.

(*A*) By train. Distinguishing between permanent, improvised, and temporary ambulance trains. If possible give the accommodation likely to be required for lying-down and for sitting-up cases. The proposed time of running the trains. Who would arrange and maintain this service? And how would the *personnel* and material for the necessary sick convoys be provided?

(*B*) By road. Scheme for: (*a*) Motor transport? (*b*) horse drawn vehicles? (*c*) a combination of the above? Provision of sick convoys? How would the above be organized and maintained?

(*C*) By boat. Give your scheme. How organized and maintained? In considering the provision of sick convoys, distinguish between those provided by detachments from regular medical units, by the Red Cross Society or voluntary aid detachments, or by the organization of local effort (see para. 267, R.A.M.C. Training).

(14) *Clearing Hospitals.*—Clearing hospitals, how many available? Their location at the time of the appreciation? Their proposed localities or movements for the operations in progress? How and where would they take over the sick and wounded from the field ambulances?

(15) *Transport for Clearing Hospitals.*—Give a scheme of transport for the clearing hospitals? (*a*) By rail; (*b*) by road. Distinguish between the transport required for personnel and material, and the transport required for evacuating the sick and wounded from places which would be fixed for the clearing hospital to take over the wounded from the field ambulances. By whom would this transport be organized, controlled, and maintained? Give also your scheme for sick convoys for this service.

(16) *Infectious and other Hospitals.*—Infectious and any improvised hospitals or convalescent depots at the advanced base or elsewhere? By whom organized, equipped, and maintained?

(III) Supplementary Proposals.

(17) *Geneva Convention.*—Proposals for the collection and transmission of information required under the Geneva Convention, 1906, Chapter I, Articles II and IV, and Chapter III, Articles X and XI, also under the Hague Convention, 1899, Article XIV.

(18) *Special Sanitary Measures.*—Any special sanitary measures or precautions necessary in connection with climate, season, water, prevalence of disease, or epidemics of infectious disease, amongst the civil population in the area of operations.

Any special points you desire to bring to the notice of C.-in-C. or any precautions you would recommend to be adopted by the troops which are not included in the above.

United Services Medical Society.

THE SANITARY SERVICE, TERRITORIAL FORCE.

By Major F. E. FREMANTLE,
Royal Army Medical Corps (*T.F.*).

As an officer of the Territorial Force I am diffident of discussing a military problem with those who by virtue of their regular service know infinitely more of military conditions and exigencies than I, and although holding a divisional appointment, my knowledge even of the conditions of the Territorial Force is necessarily limited by the fact that from a regimental medical appointment with yeomanry I was "spatchcocked in," as Sir Redvers Buller might have said, to the newly created post of Divisional Sanitary Officer on the creation of the Territorial Force in 1908. Only once since then has my Division undergone divisional training; and it was as a result of that training of the East Anglian Division at Thetford, on the border between Norfolk and Suffolk, last August, that I first had occasion to review the sanitary machinery of the Division and estimate its value for maintaining the health of the troops in case of mobilization. In drafting a report on the subject at length to the A.M.O. of the Division, Colonel G. S. Elliston, C.B., certain suggestions occurred to me for bringing the service into touch with civil sanitary administration. These were embodied in a paper read before the Home Counties Branch of the Society of Medical Officers of Health in November last and printed in *Public Health* for February. But the absence of any effective military criticism on that occasion prevented my feeling perfect confidence in the practical value of the proposals then made. In bringing them now before this distinguished body, I trust that military shortcomings may be forgiven and that the substance of the paper may be duly weighed and freely discussed.

The Sanitary Service and the Geneva Convention.

There is no need here to set out the essentially military, as opposed to the humanitarian, value of sanitation to troops in the field. Little as that is understood by most combatant officers in the Territorial Force, the responsibility for the health of the troops is nevertheless laid on them when they attain to the command of

their units as it is laid on commanding officers in the Regular army; and, as in other duties, so in realizing their sanitary responsibility and its objects they will doubtless in time follow the lead of the Regular Forces.

The fact that sanitation is primarily of military importance to an army would seem to have been realized in the Geneva Convention of 1906. For Article 9, Chapter III., expressly limits the respect and protection of the Red Cross to—note the words: "The personnel engaged exclusively in the collection, transport and treatment of the wounded and the sick, as well as in the administration of medical units and establishments," besides the chaplains and the guards of medical units and establishments furnished in default of armed orderlies, with an authority in due form. This would evidently fail to cover the R.A.M.C. men attached for water-duties and the personnel of sanitary companies. Indeed it is obvious that personnel used for the prevention of sickness have no place in a convention whose object is to secure "amelioration of the condition of sick and wounded." Inasmuch, however, as the deliberate poisoning of wells is prohibited by international law, so it would seem logical, as it would certainly be in keeping with human sentiment, that international law should confer immunity on those whose sole aim is to prevent all forms of ill-health. I should be glad to have the views of this Society on the point, in case it should not have been already considered, with a view in that case to suitable action being taken by the authorities concerned.

The Personnel of the Sanitary Service, Territorial Force.

The personnel of the Sanitary Service, T.F., differs in three important particulars from that of the Regular army. The first difference is that the A.M.O., now the Assistant Director of Medical Services, of each of the 14 Divisions of the T.F., is assisted both in peace and on mobilization, not only by a D.A.D.M.S., usually a Regular officer, retired or seconded, but also by a Divisional Sanitary Officer, a Major or Lieutenant-Colonel, R.A.M.C. (T.F.), who holds some sanitary position of importance in civil life. There are 14 such officers.

The second difference consists in the appointment, *à la suite* to the sanitary branch of the R.A.M.C. (T.), of "other specialists holding health appointment in the various counties," whose names are borne on a separate list according to a fixed establishment, and

whose services will be available on mobilization. The establishment of officers on the sanitary branch is 20 lieutenant-colonels, 40 majors, and 60 captains.

The third difference lies in the sanitary squads and sections, which in the T.F. are organized in Sanitary Companies, till recently attached to the lines of communication, but now transferred to Army troops. Of these Sanitary Companies there are two; and of them we are fortunate enough this afternoon to be promised direct information in the paper to follow my own by Major Caldwell Smith, who has from the outset commanded the second Sanitary Company.

Regimentally, as in the Regular Forces, there are sanitary detachments in the. T.F., called squads, and R.A.M.C. men attached for water-duties. The establishment for the units of a division and of a mounted brigade is as follows:—

	R.A.M.C. for Water-Duties		Regimental San. Squads	
	N.C.O.'s	Men	N.C.O.'s	Men
I. Infantry Battalion	1	4	1	8
Artillery—1 R.F.A. Bde. ..	1	3	1	8
1 Howitzer Bde. ..	1	2	1	6
1 Heavy Batt. ..	—	2	—	2
Div. Amm. Col. ..	1	3	1	8
Royal Engineers, 1 Field Co. or Telegraph Co.	—	2	—	2
A.S.C.—1 T. and S. Col. ..	1	3	1	3
1 T. and S. Park ..	—	2	1	3
Mounted Troops—				
1 Regt. Yeomanry	1	2	1	8
1 R.H.A. Battery	—	2	—	2
Mounted Bde. T. and S. Col...	—	2	—	2

The R.A.M.C. men for water-duties are trained by the medical units to which they are attached, but the sanitary squads are regimental and are trained by the Regimental Medical Officer, who examines them and submits a nominal roll to be kept by the commanding officer of the Regiment. With them the A.D.M.S. is not concerned.

Regimental Medical Officer.

In discussing the value of this sanitary establishment, let us first consider the Regimental Medical Officer. In the Regular Forces he is a general practitioner for all medical military purposes—inquisitive, preventive or curative, and has had his general medical education supplemented in the Royal Army Medical College to that end. In the T.F. he is a general practitioner from civil

life, and we can have nothing but praise for his loyalty and for his general medical attainments, which are often of a high order. But systematic education ended at his medical school; and we all know what amount of learning in public health is obtained in the usual curriculum of a civil medical school. The Regular Forces can rely on a trained and practical sanitarian in each unit as the pivot of sanitation and hygiene; in the Territorial Force in peace there is frequently no pivot, no regimental medical officer; and when he is present he is usually a layman, frequently an unappreciative layman, in the objects and methods of preventing disease and promoting health. Nor is it possible to insist on his taking out any such further specific training as might otherwise be suggested; it is difficult enough to obtain the services of the civil medical practitioner for Territorial service as it is. With the growing tendency of the State to invoke the services of our profession for the promotion of health and prevention or curtailment of disease, it is to be hoped that this gross defect in the present general medical curriculum will before long receive attention. But meanwhile there is the more need for the work of Sanitary Companies and Divisional Sanitary Officers to assist and encourage regimental sanitation. To these we will shortly revert.

The responsibility of the Regimental Medical Officer is fully recognized in T.F. Regulations, para. 35: "Medical officers are charged with advising general and other officers commanding, who will incur grave responsibility if such advice is neglected without adequate reason." But overworked medical practitioners, persuaded to join the T.F. and spend part of their holiday in camp, will not spend much time in wading through books of regulations; and neither on joining nor afterwards is it sufficiently impressed upon them that on their advice to their commanding officers depends the health and so to a large extent both the lives and the *moral*, and the efficiency and military successes of the troops in their respective units. Their curative work gives them little to do; they are but filters between the troops and the field ambulances; and as a rule they spend most of their time in camp as interested spectators. They should be required to be present at each early parade, to instruct the sanitary squads in their duties for the day; to inspect the sanitary arrangements, more especially the refuse destructor, every morning before breakfast and again before night; and after breakfast to accompany the orderly officer or the commanding officer of the unit in his inspection of the camp. In Divisional Camp, on the first day after arrival, and again at

intervals of every three or four days, they should meet the A.D.M.S. and the Div. San. Officer to report and discuss questions relating to their sanitary duties. If such duties were expected of them they would be willingly performed; and if due credit were given for their performance, the annual training would probably be regarded as a period of useful experience and service, and would increase the attractiveness of the R.A.M.C.(T.F.).

Applied Manuals.

Is it too much to ask that a concise manual should be prepared and issued for the use of Regimental Officers, T.F.; and different variations of the same manual for officers of the sanitary and medical units and for the different craftsmen enlisted from civil life as non-commissioned officers and men for the various duties of the R.A.M.C.(T.F.), giving each of them under a single cover all that he need know of the principles and circumstances of his work and of the "regulations," at present lurking in a dozen different official publications? So only will most of them easily learn the working of the machine which they have joined, and others be attracted to join it. The material exists in the excellent courses given by the adjutants of the 14 R.A.M.C.(T.F.) Schools of Instruction and the expense and labour of issuing these manuals would surely be fully justified.

Quartermasters.

In the absence of Regimental Medical Officers, the sanitary duties of Quartermasters and Quartermaster-Serjeants must be emphasized. For this purpose the small manual of military sanitation is most useful; but a new edition is most urgently required. Copies should be issued freely and should be an obligatory item in the kit of every officer and man in camp.

But the very excellent sanitary knowledge of some regimental Quartermasters is more than matched by the complete ignorance of others; and in the not infrequent absence of any Regimental Medical Officer in camp it is on them that regimental sanitation must depend. Major Warwick, R.A.M.C.(T.F.), who, as senior Medical Officer of the Essex Infantry Brigade, a Diplomate in Public Health, and part-author of the "Advanced Ambulance Handbook," now in its 60th thousand, is an exceptionally well-qualified Regimental Medical Officer, entreats me to make allusion to the need of training sanitary squads and Quartermasters, since they, he says, are particularly weak in camp sanitation. This is

true, but the Quartermasters of the Territorial Force, like the Medical Officers, are busy wage-earners in civil life, and have enough to do to learn and carry out their more particular duties. It seems impossible to impose on them any further specific training in camp sanitation than that required by the syllabus of the written part of the examination, which quartermasters must take within two years of appointment, unless they have served as Quartermaster with Regular troops, or have passed the examination for Quartermaster-Serjeant R.A.M.C. Possibly these examinations might be made more practical as regards sanitation, but, in general, trust must be laid on education by their annual duties in camp for the improved capacity of quartermasters to play their important part in sanitation.

Regimental Sanitary Squads.

We next come to the Regimental Sanitary Squads—the sanitary detachments of the Regular Forces—and these are a very weak spot in most units. What inducement can there possibly be to a Territorial soldier to spend his fortnight's holiday "in the disposal of excreta and refuse, in camp cleanliness and in sanitary police duties," and so to cut himself off from the more martial and attractive military work of his unit? The only inducements would be a special rate of pay and an enthusiastic and expert serjeant to direct their work, instead of a corporal in knowledge and experience like themselves. For this purpose civilian sanitary inspectors should be attracted to regimental service, much as civilian-qualified pharmacists are attracted to the R.A.M.C.(T.F.) by their being allowed, after a minimum test in non-technical subjects and forty-two drills, to present themselves for examination as serjeants. The importance of unit-sanitation should be ample justification for the extra expense involved.

Water-Duty Men.

Lastly, in considering the personnel of regimental sanitation, we arrive at the water-duty men, attached to each unit from the R.A.M.C. on mobilization and for annual training as laid down in War Establishments. Whilst so attached these men, subject to the Regimental Commanding Officer, are under the orders of the Regimental Medical Officers. They are shown on the establishment of Field Ambulances and Mounted Brigade Field Ambulances in which they are trained and with which they must serve their first camp. For subsequent trainings they are distributed by the

A.D.M.S. Their duties are nominally the same as in the regular forces, viz.: the daily supervision and purification of water-supply; the charge of apparatus and stores concerned with water-supply; the work of disinfection; the segregation of infectious individuals in camp; and the care of sick until removed to the field ambulance or to hospital.

But in the T.F. this amounts as a rule to no duties at all. Good care is taken that the camp is situated where there is a satisfactory public water-supply, which is usually laid on to the camp and requires no purification. Cases of infectious disease seldom occur in camp, and in all but exceptional cases, when they do occur, are promptly removed to hospital. The sick require little care if they are well enough to remain within their own lines.

What wonder, then, that these men are most difficult to recruit? There is nothing for them to do. They are not allowed to take part in the usual sanitary work for which they have been trained for fear of their contaminating the water which they are supposed to have to purify; and yet they are the only men in the unit who have been trained in sanitation. And socially—which is the chief consideration in a voluntary force—they are pariahs, outsiders in the regiment and yet never at home in the R.A.M.C. unit, in the establishment of which they are shown.

Nor would they as a rule be required on mobilization. For the T.F. operates only in this country, where most water-supplies are at least sufficiently pure for use by troops on active service, and the essential and more practical need would be to prevent pollution of streams and wells by the troops.

If it is thought advisable to retain them, I would submit that there cannot be any serious reason against their being used for the general sanitary work of the units to which they are attached. But it would be infinitely better to abolish them.

Regimental Sanitation as a Whole.

This sketch of the regimental sanitary arrangements will suffice to show the precarious state of affairs in the T.F. Add to this the atrophy of his natural instincts in the civilized being of to-day, the individual comprising the T.F., who turns a tap to get his water and pulls a handle to dispose of his refuse, and it is easy to imagine the sanitary chaos that would endanger the T.F. in case of mobilization. There is need, therefore, for the introduction of the expert sanitary unit; the Sanitary Company as a practical school of instruction in camp, with its keenness, its unity, its

experience and expert knowledge, to carry out much of the actual constructive sanitation and to supervise the water-supply when necessary, leaving it to the regimental sanitary squads to assist in such constructive work and to be responsible for its maintenance. The two existing Sanitary Companies are now Army Troops. Authority should be given for the formation of one sanitary company in the area of every Division, as Divisional Troops, perhaps under the immediate supervision, if not command, of the Divisional Sanitary Officer. The possibility of recruiting and using this unit can only be proved by experience; but the immediate value, first to one Brigade then to another, of having the Sanitary Company of the Division training by its side and supervising its sanitation, would be untold; and there is not a single Commanding Officer of any unit who would not welcome this solution of the annual difficulties which he experiences in the sanitation of his camp.

Relations of Civil to Territorial Sanitary Administration.

Let us now consider the relations of the Territorial Force with the Civil Sanitary Administration. Here again we come on a vital difference between the requirements of the Territorial Force and those of the Regular army. For the Territorial Force, will, on mobilization, as in their annual training, be operating invariably in friendly country, in every town, village, hamlet or house, and in every field or other conceivable camping site, of which there is already operative a very fairly successful sanitary administration. The information and procedure thus available will of course require adaptation to military purposes; but it would be folly in the work of the citizen army to ignore this universal and constantly improving provision, whereas the Regular Forces must ever be prepared to operate in unfriendly country, where no civil sanitary administration exists or can be relied on.

The scheme of the Regular Forces has naturally provided the general scheme of constitution and operation for the T.F. But in this particular I would submit that there is cause for introducing a difference. The relations of the T.F. with Civil Sanitary Administration should be forged into a definite connecting link.

For each annual training, in the first place, it should be made the first duty of the Div. San. Officer, on behalf of the A.D.M.S. to establish relations with the county and district medical officers of health of the neighbourhood of each camp; to ascertain from them and report the sanitary circumstances of military importance to the proposed camp and to the intended operations; and to invite

them in turn to visit the camp, when occupied, and discuss the relations established between civil and military sanitation. Their friendly criticism would be of first value, and they would appreciate the rare opportunity of making acquaintance with military sanitation in practice. A similar opportunity might well be extended to all medical officers of health in the area of the division.

Secondly, I would suggest a far more intimate and permanent association between the civil and military sanitary systems. Thus, for instance, the surveys at present being undertaken on behalf of the Territorial Force in certain parts of the country are partial in the extreme, and have given rise to considerable complaint from the civil officials called on, merely as an act of courtesy, to comply with the requests of the Divisional Sanitary Officer. I submit that it is obviously inadvisable to devise schemes for independent sanitary surveys on behalf of the Territorial Force without first considering the information available from civil sources. Both county and district medical officers of health are resident in or near their respective areas; are usually on the telephone, and hold their offices with rare change. They are bound to be acquainted with the water supply, food supply, drainage, geology, topography of the districts; with the prevalent conditions of health, and the available means of disposal of refuse or isolation of infectious sick. Now counties and county boroughs between them cover the whole country. The county medical officer is in touch with all the district medical officers of health in his county and by the nature of his work can generally find time, as it is his duty, to consider the influences of any sudden influx of population into his district, whether in the nature of harvesters, hop-pickers, fruit-pickers, gipsies, navvies, or military troops.

In time of war this would be an invaluable asset. It would be the greatest possible mistake, even if feasible, to take the district medical officers of health from their posts, in which they could indirectly afford invaluable help to the troops by maintaining a network of sound military conditions throughout the country. But the county and large borough medical officers of health could give their whole time and services, if needs be, for a time to the assistance of the Territorial Force.

Thus, when asked by my A.D.M.S. to report on the water-supply available for two sites suggested for this year's camp, I wrote and telephoned to Major Nash, R.A.M.C. (T.F.), *à la suite*, County M.O.H. for Norfolk, and was soon able to give the required report.

Again, in a recent staff-ride at Ipswich, I was ordered to advise

with regard to the billeting of troops in the town that same evening. I went at once to the office of the M.O.H., found he was at the Isolation Hospital, made an appointment with him by telephone, and at once learnt all that was necessary, with regard to the sanitary condition of the housing in different quarters, the water-supply and the existence of one or two cases of diphtheria.

Similar information would be forthcoming in every corner of the United Kingdom.

On mobilization the same considerations hold good and should therefore be adopted. The Divisional Sanitary Officers should be the county medical officers of health within the areas from which their Divisions are drawn. It should be their first duty to establish relations with other county and large borough medical officers of health in the area; and it is these officers without any exception, and these only—with the addition of any gentlemen who may have had previous experience of public health work, if they are available for service in case of need and are not indispensable by reason of borough or district employment—who should be given *à la suite* commissions in the Sanitary Service of the Territorial Force.

Each division would thus possess a staff covering in their civilian capacities the whole area comprised in that of the division, and the Div. San. Officer would thus have a complete machinery with which to prepare the sanitary surveys that should now be prepared without further delay. This would involve no demands on the civil administration beyond those for which the civil law already provides: for by the "Housing, Town Planning, &c., Act," 1909, every county is bound to have a County Medical Officer of Health, who is given power to demand from every District M.O.H. in his area any information he may require for the purpose of his duties; and those duties are prescribed by the Local Government Board. All that is required is for the War Office and Local Government Board to co-operate in the matter: to make it the duty of every County or District M.O.H. to give such information and assistance as he may reasonably require to the Divisional Sanitary Officer of Troops operating in his area; and it may be left to the preference of each such official to be appointed an Officer *à la suite* or not, for it will make no difference. I have never been able to see what functions an *à la suite* officer would perform, beyond those which he would naturally perform in his civilian capacity. The T.F. Regulations (73) prescribe their duties as follows: "On mobilization they will be appointed under the arrangements of A.D.'s, M.S., within whose areas they hold health appointments, to perform

sanitary duties within their districts, if to be occupied by troops." But it is already his first civil duty to "inform himself as far as practicable respecting all influences affecting or threatening to affect injuriously the public health within the district," and to take all necessary steps and give all necessary advice to his council in these matters, whether concerning residents or others in his district; and this would certainly apply to troops.

Such co-operation involves, it is true, the goodwill and some expenditure of time and trouble on the part of district medical officers of health, whenever they may be asked to contribute their share of local knowledge, or to assist in the preparations for a summer's camp. But the basis of national defence by a citizen army must ever be that each should contribute according to his ability; and we may be confident that our professional brethren, as civilian officials, will be glad thus to play an important part in providing for the defence of the home country.

DUTIES OF SANITARY COMPANIES, TERRITORIAL FORCE.

By Major CALDWELL SMITH.
Royal Army Medical Corps (T.F.).

The Sanitary Companies of the Territorial Force have, as such, no equivalent in the Regular Forces, and possibly in consequence of this there are no definite Regulations laid down for their guidance in either instruction or work in the field.

That this has been, to some extent, a hindrance to the Sanitary Companies, I think there is no doubt; but fortunately, speaking for my own company, no serious objections have been taken by higher authorities, both combatant and otherwise, to the methods carried out by the officers commanding for the training and efficiency of these units. Some difficulties have, however, arisen, and I shall endeavour to point these out and to suggest the measures which might be adopted to remove them.

For the past three years I have been endeavouring to persuade the War Office to carry out some changes in the personnel and to supply some necessary equipment, but so far nothing has been done with regard to the personnel, although some equipment has been supplied.

With regard to the personnel of the companies, this consists in each company of five officers, four serjeants, five corporals, and eighty-six men, five of these latter being batmen.

In my opinion, and in this the Officer Commanding the 1st Sanitary Company concurs, although the number of officers is satisfactory, yet the number of N.C.O.'s is not sufficient for the work which we have for the past four years been endeavouring to carry out.

It was suggested by us that the N.C.O.'s should consist of one Staff-serjeant, eight serjeants and eight corporals. This would allow for the splitting up of the company into eight sections, each section consisting of a serjeant, a corporal and eight men. Four of the Officers would supervise the work of these sections, one officer to two sections, while the Officer Commanding with the Staff-serjeant could supervise the whole.

This scheme, however, did not appeal to the War Office, and was not approved. Some of the reasons which prompted me to put forward these alterations were: (1) that in the work of sanitary inspection it is absolutely necessary to have the men split up into small sections or squads; and (2) that it is necessary for each squad to have a serjeant in command, this N.C.O. to have a thorough grasp of his work, and preferably he should be in civil life a Sanitary Inspector, who is accustomed in his daily work to deal with the abatement of all kinds of nuisances, the inspection of food, the prevention of infectious diseases, skilled disinfection, and other sanitary matters which would, in the field, also be dealt with by the companies. In my own company all the four serjeants and several of the other men of the company are sanitary inspectors in civil life, and I can speak most highly of their work at the annual training during the past three years.

Another point in connexion with the personnel of the company is the absence of a permanent staff.

Even in a small unit the amount of correspondence and other clerical work is very great, and taxes not only the time but the patience of a Commanding Officer. The number of returns of all kinds to be filled in, the keeping up to date of all attestation forms, of the clothing ledger and equipment ledger, and all the other numerous details which are necessary, if the work is to be done satisfactorily, means that the Commanding Officer has to be quartermaster, adjutant, clerk, and general utility man for the unit. As can be readily understood, this prevents the Officer

Commanding from devoting his energies to the more important work of the company, viz., the supervising and personally taking part in the technical instruction of the unit.

It is quite possible that this may be remedied when proper Headquarters are available.

With regard to the training and work of the unit I should like, in the first place, to mention what I have tried to carry out during the past three years when I have been in command of the company, and this may be conveniently divided into (I) Training and work during the year, (II) Training and work when at camp.

With regard to (I) I need only mention that company drill and instruction in first-aid have been carried out as satisfactorily as could be done in a small unit. I wish more especially, however, to mention the technical training carried out by means of lectures and practical instruction.

Until recently no equipment has been in the possession of the unit, but, after a considerable amount of correspondence, I have been able to secure the provision of certain equipment which will prove of great assistance in carrying out our work.

It has been suggested, I think by Colonel Firth, that a Sanitary Company should be in possession of the following special equipment :—

(1) Filter water-cart.
(2) Apparatus for distilling water.
(3) Chemical agents for clarification of water.
(4) Picks and shovels, six of each.
(5) Apparatus and chemicals for analysis of water.
(6) Portable disinfector.
(7) Disinfecting sprayers and disinfectants for use in these.
(8) Bacteriological and microscopic outfit.
(9) Carpenter's tools.

Picks and shovels, carpenter's tools, and apparatus for the analysis of water have been supplied, and I have had the use of a filter water-cart for instructional purposes.

Lectures and instruction have been given to the unit on :—

(1) Water and water analysis.

(2) Infectious diseases and their prevention, including the use of disinfectants and disinfecting apparatus.

(3) Camp sanitation generally, including the construction of latrines, urinals, destructors, and grease traps.

(4) Sewage, its composition and purification.

(5) Inspection of food.

(II). Work at Annual Training.

The instruction in the above has been put to practical tests in camp, and speaking for my own company, I think I may say that the training given has been of some use to the division generally.

The special work carried out in camp has been generally of a supervisory and advisory nature, but when necessary the men in the unit have done a large amount of practical work in the construction of various forms of destructors, urinals, and grease traps for other units. These should of course be made by the sanitary squads of the various units, but until last year hardly any of the combatant units had sanitary squads, or rather, regimental sanitary detachments, and the men detailed to carry out these duties had little or no knowledge of the proper methods to be adopted.

Generally speaking a day's work of the company in camp was as follows:—

(1) 4.30 to 5 a.m. Inspection of meat at supply depot before issue. This was carried out by an officer and six men of the company. As in the company under my command, several of the N.C.O.'s are Sanitary Inspectors and possess the Meat Inspector's Certificate from the Sanitary Institute, this inspection ensured that the meat provided was sound and in good condition.

(2) 6 to 7 a.m. Squad or company drill.

(3) 9 a.m. to 1 p.m. Inspection of camps. Two or three squads, according to the size of the camp, consisting of one officer and six or eight men were detailed to make a complete inspection of all the camps and to note any defects in the sanitary arrangements, and to make a report to the Officer Commanding.

As a rule, during inspection, if any grave nuisances were detected the attention of either the Rgtl.M.O., or the Q.M. was called to the matter, and this officer was advised as to the best methods to be adopted to remove the nuisance.

This work was of great importance and I think I may say appreciated, not only by the various units, but also by the G.O.C.

As the Officer Commanding the company was not given any executive power, the reports made to him were not officially sent to Headquarters, and so their work did not interfere with the duties of the Sanitary Officer to the Division.

I am glad to say that during the last three camps no friction of any kind has been caused by these inspections, and I attribute

this to the fact that the officers of the Sanitary Company have always endeavoured to secure the co-operation of the Rgtl.M.O.'s or the Q.M.'s of the various units.

(4) 3 to 4 p.m. Lecture to men on sanitation, or practical instruction in field work.

(5) Route marches with instruction on the march on the sites for camps and bivouacs.

The above course of work and training will, in my opinion, be of the greatest value in the duties which the company may be ordered to carry out on mobilization, although it is extremely difficult to say exactly what duties Sanitary Companies may be called upon to perform.

If they are to be employed on lines of communication it is possible that they would be formed into sanitary sections and squads, and their duties would be similar to those laid down in Field Service Regulations, para. 72, but in addition there is no doubt that they would require to act as Sanitary Inspectors over the whole area of the sections, and supervise the sanitation generally among the civil population, carrying out any schemes which might be drawn up by the members of the Sanitary Inspection Committee for the co-ordination of the military with the civil sanitary organization.

If, as is more than likely, no lines of communication existed, how could the services of these companies be utilized? I think that in all probability as soon as mobilization is ordered large concentration camps will be formed, consisting of two, three, or even more divisions, and in these concentration camps the company might carry out similar work to what I have described as being carried out at Annual Training in camp, as well as perform all the duties of sanitary squads under the direct supervision of their own officers.

It may reasonably be asked, will the duties of these Sanitary Companies interfere with those of the Divisional Sanitary Officers or of the Medical Officers of Health of the areas in which the camps are situated.

I think not. There is no reason why the co-operation of all these officers should not be secured. With regard to the latter, I have had practical experience of this in at least one camp where the assistance of the Civil Medical Officer of Health was cordially given and proved of the greatest value, not only to the officers of the Sanitary Company, but also to the whole of the troops encamped.

For the greater efficiency of these Companies I would suggest :—

(1) That the number of N.C.O.'s be increased.

(2) That assistance be given by a member of the permanent staff, or by the appointment of one for each Sanitary Company and the two General Hospitals in each Division to carry out the clerical work.

(3) That additional special equipment be provided, such as disinfecting apparatus, bacteriological and microscopical outfits, and a filter water cart, so that the men can be properly instructed.

(4) That a distinction should be made in the uniform of these Companies from that of other units of the R.A.M.C., so that their services may not, as has been done in the past, be requisitioned for work other than they are trained to carry out.

(5) That members of the unit who possess certificates of proficiency in sanitation from some recognized body, and who are employed as Sanitary Inspectors in civil life, should, if qualified for corporals, be appointed lance-serjeants and be paid as second class orderlies.

I shall leave to others, and especially to those who have seen the work of the companies at camp, to decide whether these companies have justified their formation or not.

It may be argued that the sanitation of camps should be supervised by every C.O. and by the Divisional Sanitary Officer, that at any rate in peace the work of the Companies is superfluous, and that if any additional inspection were necessary this could be carried out by N.C.O.'s from the R.A.M.C. trained with the field ambulances, but attached during training camps to divisional headquarters, and who would be directly supervised by the Divisional Sanitary Officers.

It might also be argued that sanitary squads and sanitary sections could be trained by the field ambulance, and be part of their personnel, as is the case with the R.A.M.C. men for water duties.

Another point which I would like to mention is that the services of the Sanitary Companies might be utilized by other divisions than the 1st and 2nd London Divisions. As they are Army troops and only attached to the London Division for administrative purposes, there is no reason why one or both of the companies should not carry out their annual training with a different division each year, and become educational factors in the sanitary instruction of all the Territorial troops.

On these and other points I am sure the officers of the Sanitary Service will be glad to have the opinion of those present.

DISCUSSION.

Major E. B. WAGGETT, R.A.M.C. (T.F.), said that he hoped that the Territorial Force would not be collected in large concentration camps on mobilization; even in the small camps at the annual training there was a good deal of unnecessary sickness at the end of the camping period, which he attributed to the defective sanitary conditions of the camp, from a lack of knowledge on the part of the Territorial officers of the principles of camp sanitation. One great source of trouble was the civilian contractor, who was, in his opinion, a most dangerous person; it was enough to make one's hair stand on end to see a cart containing urine and excreta dragged right through a big camp slopping its contents on the way. He agreed that it was very necessary for the Army to keep in close touch with civilian sanitarians who knew their own districts intimately.

Brigade-Surgeon Lieutenant-Colonel BEATTIE thought that in time the Territorial Force would act as a great training school in sanitation, and that from it one would be able to draw trained sanitary inspectors for civil work.

Colonel HARPER, R.A.M.C. (T.F.), laid great stress on the need of a small manual on military sanitation for the use of regimental medical officers of Territorial units. They were busy men, and it was difficult for them to wade through the larger training manuals and pick out those things which applied to their particular job. His experience was that it was almost impossible to enlist men for the water duties; there was not sufficient prestige attaching to the position, and as a matter of fact when troops depended entirely on piped water supplies as they did in the annual camps, there were no water-duties to perform in peace time by which men might learn their functions in war. In the absence of sanitary squads, who could not be got to enlist in the 1st London Division, detachments of the sanitary companies had been attached to each brigade for advisory duties and inspections; the actual work was done by regimental fatigue parties. If the sanitary companies were so split up, it was necessary to have a very high proportion of N.C.O.'s in them. In the 1st London Division the men, while performing sanitary duties, wore a yellow brassard, which served to secure that they were not commandeered for other work.

Lieutenant-Colonel B. M. SKINNER, M.V.O., R.A.M.C., said that he wished to thank the officers who had provided two such interesting papers. The Territorial Force seemed to have a different idea of sanitation from the Regular Army, where the combatant officers had to know about the sanitation of their units and to keep it in order. It was

impossible to force sanitation on people from outside—they must themselves be interested in it and themselves carry out the necessary measures, acting under the advice of the expert medical and sanitary officers. The idea that one could depend on the civil arrangements for the maintenance of health was wrong; water supplies and sewage schemes would not remain as in peace; the whole arrangements would break down in a few weeks after war started, either by the action of the enemy or by the necessities of the army itself, and one must be prepared to carry out sanitary measures as if no arrangements whatever existed beforehand.

The President said that he thought there was very little hope of getting combatant officers of Territorial units to carry out their own sanitary arrangements.

Major Fremantle, in reply, said that he was not hopeless about the sanitary training of the Territorial officers and men; he agreed with Colonel Skinner that it was necessary to work through people themselves, and the main thing was to train the combatant officers and men; the sanitary company could provide this training by lectures and by the practical example of their work in the field. He thought it was a very bad thing for Territorial troops to march into camp and find their latrines and other sanitary arrangements ready made for them.

Major Caldwell Smith, in reply, agreed that the education of the people to be cared for was a first essential; he himself had given periodic lectures to this end. He suggested that the regimental medical officer should give one lecture annually on elementary sanitation to each company in his regiment. He objected to the splitting up of the sanitary company which was suggested by Colonel Harper; such an arrangement destroyed all connection between the C.O. of the sanitary company and his men, and it was not necessary as it was quite possible for the company to live together and to be detailed from day to day for whatever tasks were needed in the division.

Clinical and other Notes.

INCIDENCE OF PHTHISIS IN A SERJEANTS' MESS.

By Major E. C. HAYES.
Royal Army Medical Corps.

The medical officer in charge at Winchester, Lieutenant-Colonel W. L. Gray, R.A.M.C., raised this question as a problem that required some elucidation. The results may not be very conclusive; but I venture to bring them forward for publication as the facts of the case are interesting. It would not be fair to claim their entire correctness, for it will take two or three years to justify the present deductions. As a parallel I would refer to the history by Dujardin Beaumetz of eleven cases of phthisis that occurred among twenty-three clerks in an office during the course of twelve years, as the result of the introduction of the disease by the first sufferer.

In the early part of May, 1911, Lieutenant-Colonel Gray drew attention to the fact that Serjeant B. had been admitted into hospital suffering from tubercle of the lung, and reported that he "is one of a series of five cases which have occurred in this garrison, all having one common factor, viz.: sleeping, eating, or both, in the Serjeants' Mess of the Depot of the Hants Regiment. The striking feature is the fact that no cases of men suffering from this disease have been admitted to hospital during this period from any other source in the barracks. Milk and food for the serjeants' mess come from the same source as for the rest of the barracks."

The following table was appended:—

Table of Tuberculosis of the Lungs, Winchester, 1906-11.

Corps	Rank and name	Date of admission	Date of transfer	Patient slept in barracks	Patient messed in barracks	Remarks
Hants depot	C.-Sjt. P.	4.8.06	20.8.06	Bunk in serjeants' mess	Serjeants' mess	All seasoned old soldiers. Average age. About 18 years' service.
,,	C.-Sjt. D.	1.1.07	7.1.07	Bunk in barracks	,, ,,	
,,	Sjt. H.	18.1.07	26.1.07	,, ,,	,, ,,	
,,	Sjt. F.	9.2.08	15.2.08	,, ,,	,, ,, (mess caterer)	
,,	C.-Sjt. B.	21.4.11	Still in hospital	,, ,,	Serjeants' mess	

The serjeants' bunk was closed at the end of 1906, fumigated, &c., and the mess woodwork renovated. Prior to that three cases slept in the serjeants' mess, one being the mess caterer. No other cases among men were admitted for tubercle of lung from any other portion of the Rifle or Hants Depot Barracks during the period in question.

An immediate visit was paid to Winchester, and an interim report made.

Shortly afterwards, armed with fuller documentary evidence extending over five years, the conclusions mentioned in the second report were come to.

The gist of the reports was as follows:—

FIRST REPORT.

I visited the serjeants' mess, depot of Hants Regiment, Winchester, in company with the medical officer in charge, Winchester, and went through the entire building. I did not discover any obvious predisposing cause of phthisis in the building.

The only room used as a sleeping compartment during the past three years is a room in the lower storey, a semi-basement room. No known cases have occurred amongst the sleepers in this room. On the other hand a room referred to as a 'bunk' in the third upper storey, the cubic capacity of which is over 2,500 cubic ft., yielded the first two cases in Lieutenant-Colonel Gray's list. No man has slept therein for over three years. The last case in the list who is now suffering from phthisis also slept in that room three years ago—but I presume no connexion after so lengthy a period can reasonably be attributed to such remote occupation.

It is to be noted that after the occurrence of the first two cases the room in question is stated to have been thoroughly disinfected, and about this time much of the old woodwork of the mess generally, including that of the ante-room, recreation and dining-rooms in the basement, was renewed.

I can at present see no reason for impugning the sanitary condition of the serjeants' mess on account of the occurrence of the reported cases of phthisis during the past five years.

Of the five cases two only in my opinion are likely to be connected by the direct personal association of sharing the same sleeping apartment, that is Nos. 1 and 2. These cases were contemporary occupants, and the disease occurred at a reasonable intervening period to suggest such direct connexion. It is to be noted that there is no evidence available to show that the disease originated by such occupancy.

Hence other reasons must be sought for the prevalence of the reported incidence amongst the serjeants. These reasons are not obvious, and the subject requires some probing. It is an easy matter to dismiss the circumstance as a coincidence; but before doing so I think it would be well to call for further particulars of the cases.

I should like to see the clinical reports of these cases, particularly as to the cause to which the disease was originally attributed, and as to the existence of a family history of tubercle. The possibility of the overcrowding of the ante-room, dining-room and recreation-rooms of the

mess, a record of the serjeants sleeping in as well as of those using the mess at night for recreation should be ascertained, also whether spittoons or sawdust were used, and whether a notice prohibiting indiscriminate expectoration was posted. In my brief visit to day, these items of information could not be supplied off hand, and when I am supplied with them I propose to revisit Winchester if necessary.

Second Report.

On going further into this matter I find that Army Forms A.35 were duly rendered in the five cases previously referred to and afforded the following information:—

(1) Colour-Serjeant P. On his own statement "the disease started four months ago." (That would be the end of 1906.)

(2) Colour-Serjeant D. Onset date uncertain. Reporting medical officer states: "I have no doubt in my own mind that in the present case the disease was contracted by direct infection and close intimacy with a consumptive patient." (This was apparently Colour-Serjeant P.).

(3) Serjeant H. Occupied No. 2 N.C.O.'s bunk, B. Block, Hants Depot. Onset: "Probably about three months ago" (i.e., October 22, 1906). Source: "Suspected to have been contracted in serjeants' mess. Within the last six months there have been two cases of tubercle of the lung amongst the members of this mess. Working on the supposition that the disease was contracted in the serjeants' mess I have had the mess vacated with a view to the whole place, walls, floors, &c., being well scraped and thoroughly disinfected."

(4) Serjeant F. Occupied No. 3 Bunk, B. Block, Hants Depot. Onset: "Very doubtful. Has been in delicate health with a cough *for years*. There is little doubt that he contracted the disease before arrival in this station." Came to Winchester from Malta in May, 1906.

(5) Colour-Serjeant B. Onset: one year ago, i.e., May, 1910. Quarters: during the last four years has occupied N.C.O.'s room No. 4A, "A" Block.

In accordance with my request the medical officer in charge forwarded some clinical reports, invaliding documents, and medical history sheets that were in his possession, but no further information than the above could be deduced therefrom.

It seems to me, as stated before, that cases Nos. 1 and 2 are directly connected. From the information I have now obtained from the Army Forms, A 35, I think it is not incompatible with the facts that Serjeant F. may have been the originator of the whole series in that he had been "in delicate health with a cough for years" (he was subsequently proved to be suffering from tubercle); he arrived at Winchester in May, 1906. (Note that Case No. 1, Colour-Serjeant P., gives the date of his illness as the end of April, 1906); he was mess caterer, and probably very frequently expectorated infective material in the mess premises.

The disinfection of the mess, arranged and carried out in the early part of 1907, probably did good, but the mess was occupied by Serjeant F. for a full twelve months thereafter, and the possibility of further infection having taken place is only too probable. During this period, Case No. 5, the last in the series, was a frequent user and occupier of the mess. In his case it is interesting to observe the date of onset is given as one year ago, i.e., May, 1910. That would be an interval of two years from the time he associated with the previous case (No. 4, Serjeant F.); so that the direct connexion is not well proved.

Nevertheless, I think in face of the above facts that it would be well to vacate again the serjeants' mess and have all the rooms scraped and lime washed, the floors and woodwork washed with cresol solution, all culinary and other vessels disinfected. The spittoons in use should be boiled and treated with cresol. I suggest that cresol solution be substituted for sawdust in the spittoons in future; and it would be advisable to post an anti-spitting notice.

Furthermore I am of opinion that all the present members, occupiers and users of the serjeants' mess should be medically examined with a view to excluding reinfection by an incipient phthisical carrier.

In conclusion, I have to thank Lieutenant-Colonel Gray, R.A.M.C., for the very useful help he gave me in collecting all local information in the matter, which was more arduous than appears from the brevity of my digest of it. I have to acknowledge with thanks both his and Colonel Hathaway's permission to publish these facts.

HENOCH'S PURPURA IN ADULTS.

By Lieutenant G. H. Dive.
Royal Army Medical Corps.

Of the etiology of Henoch's purpura very little is known; two-thirds of the recorded cases occur below the age of 20, and three-fourths in males, but climatic and racial peculiarities seem to have no bearing on the incidence.

The pathology again is obscure. An angio-neurotic condition is almost certainly present, and analogy would suggest that it is due to a toxæmia whose origin is commonly attributed to intestinal causes; however, it seems probable that the attendant colic is a symptom of a general disease rather than of a local process; in other words, angio-neurotic œdema of the intestines is present.

The symptoms, any one of which may be absent in individual cases, are well known: arthritis, gastro-intestinal crises, hæmorrhage from mucous membranes, and skin lesions such as purpura, urticaria, œdema, and erythema. Acute nephritis is the most common complication.

The course is very variable, the usual sequence being arthritis,

purpura, and colic, with melæna; single attacks lasting three to four days, and recurrences occurring four to five times in an average period of one month. The prognosis is fair (mortality 8 to 25 per cent), and better in children than in adults. As regards treatment, turpentine, despite its action on the kidneys, is probably the best drug, but opium may be required to relieve the excessive pain. Salicylates are useless.

The three following cases occurred recently at the Queen Alexandra Military Hospital.

Case 1.—Serjeant, aged 27, six years' service. Recovery. Five days after a characteristic onset of mild arthritis, resembling that of rheumatic fever, associated with a moderate degree of pyrexia; a macular eruption appeared about the knees. Two days later purpura was present on the forehead, shoulders, and knees, while there was severe bleeding into the substance of the tonsils. The next day the sterno-mastoids were stiff and swollen, probably as the result of a serous effusion into their substance. Two days later slight hæmoptysis developed, and lasted three days; pain was experienced in the chest, but no physical signs were found. The purpura gradually became general and severe, and in addition bleeding from the mucous membrane of the mouth and tongue was very marked, the breath being extremely foul. Colic, swelling, and rigidity of the abdomen did not appear until the fourth week; but for three days the question of acute abdominal disease, such as appendicitis, had to be considered.

There was no subsequent melæna. Fever throughout was mild, and the albuminuria transitory and variable in amount, being at times severe and at other times almost absent.

A temporary mitral systolic murmur was present during convalescence.

The stress in this case fell on the skin and mucous membranes, but, possibly owing to the comparative escape of the kidneys, an apparently very critical case recovered.

Case 2.—Gunner, aged 21, four years' service. Died. The initial symptom was again pain in the ankles, followed on the next day by abdominal colic, and two days later by hæmatemesis. The abdomen was distended, there was severe (bilious and blood-stained) vomiting, and the bowels were inactive. Any doubt as to the immediate condition was soon set at rest by the occurrence of profuse diarrhœa, all the stools containing much altered blood.

It was not until the seventh day that purpura appeared on the parts exposed to pressure, and on those within easy reach of the hands, the skin being very irritable. The pain, vomiting, and diarrhœa ceased, but fresh joints became affected, and on the twelfth day copious hæmatemesis developed; much albumin was present in the urine, but no blood or casts were found at this time or later. Three days later a fresh crop of purpuric spots appeared on the back, and bleeding from the gums and nose developed; the punctiform hæmorrhage soon became general, the

hæmatemesis continued, but bleeding from the mouth and intestines had ceased for the time being, although colic was still very marked. On the twenty-second day slight melæna was observed, and diarrhœa again developed. Improvement followed, but on the twenty-eighth day of the attack profuse diarrhœa (non-hæmorrhagic) commenced followed by profound collapse and death within four hours. Post-mortem there was found hæmorrhage into the walls and lumen of the whole length of the intestine as well as acute congestion of the kidneys.

Case 3.—Private, aged 19, one month's service. Died. On the fourth day after the advent of "rheumatic" pains in the arms and legs, severe colic affecting the whole abdomen appeared; this was accompanied by purpura, which was confined to the feet and buttocks, and had a linear distribution corresponding to the cutaneous nerves of the localities involved. At the end of the first week two larger purpuric spots had appeared on the left hand. The temperature was now subnormal, bilious vomiting and constipation were present, and the abdominal pain decreased. The next day a fresh crop of purpuric spots developed, and also a large serous effusion into the tissues of the left arm. On the eleventh day blood appeared in the stools, and a recrudescence of fever and of "rheumatic" symptoms in the knees and shoulders caused considerable disturbance to the patient.

At the end of the second week the general condition had much improved, there was no fresh purpura, colic had almost ceased; there was no more vomiting, and the stools were normal. Two days later purpura and colic again developed, and on the nineteenth day acute nephritis was present. At this stage the whole appearance was that graphically described as "acute abdomen," and the appearance of a visible "sausage-shaped" lump might readily have led to the supposition that one was dealing with a case of intussusception. Blood appeared in the vomit and stools, the nephritis became rapidly worse, and the patient died on the twenty-first day after the appearance of the initial symptoms. A moderate degree of fever with periods of intermission, but no rigors, was present during the whole course of the illness.

It is particularly unfortunate in this case that no post-mortem examination was obtained. The sequence and symptom complex were characteristic of Henoch's purpura, and the resemblance to Case 2 was very striking.

I am indebted to Lieutenant-Colonel Maher, R.A.M.C., for permission to publish the above accounts.

A fourth case, for details of which I am indebted to Major McLennan, R.A.M.C., bears many points of resemblance to the three already described. A young soldier, coming under observation as a possible case of appendicitis, during an illness of ten weeks developed arthritis, melæna, epistaxis, and nephritis; frequent recurrence of the purpura was a notable feature. The possibility of an extraneous cause is suggested in this case.

As regards individual symptoms, the colic demands the most attention. In a certain percentage of cases the abdomens have been explored, and in some it is only by the greatest attention to the history, particularly to the sequence of events and to the presence of even small purpuric patches, which should always be carefully sought for, that laparotomy can be avoided. Other cases at the onset resemble very closely rheumatic fever, but the purpura and colic appearing later lead one to a correct diagnosis.

Nephritis is found in nearly all the fatal cases; in those which apparently recover, and in which this symptom has been present, the albuminuria very often persists, and the expectation of life is thereby materially diminished.

With regard to the hæmorrhage, attention has been called to the similarity between Bright's disease with bleeding and Henoch's purpura with nephritis. Intestinal symptoms in Bright's disease are also not uncommon. The sequence, however, is quite different. In one case the nephritis precedes the hæmorrhage, in the other it follows; in none of the three cases quoted were there any changes in the fundus oculi.

THE VALUE OF QUININE AS A MALARIAL PROPHYLACTIC.

By Captain C. RYLEY.
Royal Army Medical Corps.

The case against quinine as a malarial preventive has been very strongly put in the last few numbers of the Journal, but some further confirmatory evidence may not be out of place.

There is a tendency amongst combatant officers to believe that if their men are dosed sufficiently with quinine, antimalarial precautions are superfluous. A few years ago, when Sanitary Officer in Hong Kong, I was greatly disappointed with the results of quinine as a malaria preventive, and determined to make a practical test of its efficacy. The opportunity was afforded when A and B Company of the Middlesex Regiment, which had recently arrived in the Colony, and were consequently free from infection, were simultaneously ordered to proceed to camp in a very malarial district, to undergo a month's musketry training. A Company were given a dose of 5 gr. of quinine sulphate daily during their stay in camp. B Company were allowed no quinine. The dose was fixed at 5 gr., as it was considered the maximum amount that a man could take without interfering with the accuracy of his shooting. The officers took an intelligent interest in the experiment, insisting on there being no absentees from the daily quinine parade, and giving a double dose to any man who was seen to eject the drug. The two companies were encamped side by side. The incubation period of fourteen days

having been confirmed by previous observations it was decided, in working out the malarial incidence in the two companies, to include only those reporting sick a fortnight after entering camp to a fortnight after leaving it. The result of the experiment was as follows:—

A Company 47 per cent infected with malaria.

B Company 49 per cent infected with malaria.

The diagnosis was in every case verified microscopically, the parasite found being the benign tertian variety in almost every instance.

When one takes into consideration the greater difficulty of finding the parasites in the blood of a patient who has been taking quinine, one realizes from the above figures what a scant protection the drug gave to the men of A Company.

That this failure was not due to any deterioration or staleness in the quinine used was proved by the fact that, in therapeutic doses, the same stock solution speedily removed the parasites from the blood of patients in hospital.

Experience afterwards proved that to keep men free from malaria whilst under canvas it is essential to select camp sites that are elevated and windswept, and as remote as possible from native villages.

With regard to barrack infection, many officers must have been struck with the fact that occupants of one or two rooms will show a malarial case incidence out of all proportion to the other inhabitants of the barracks. This I believe to be due to a few infected mosquitoes becoming domesticated in these rooms, roosting under the beds during the day and infecting a fresh victim every night. I have obtained most gratifying results in these cases by thoroughly fumigating the rooms with sulphur.

A CASE OF POISONING BY QUININE.

(*Communicated by the Director, Medical Services in India.*)

The following case is of sufficient interest, if only from its rarity, to warrant record. The facts are as follows:—

Private M. D., 2nd Cameron Highlanders, was brought to the Station Hospital, Bangalore, at 11.45 a.m. on March 4, 1912, in a comatose condition. The history of the man was that he was employed in the regimental mineral water factory. Not feeling very well, he told a comrade that he thought he had a "touch of fever," and then proceeded to actually swallow two fluid ounces of "essence of quinine," a reagent used in the factory for flavouring an aerated drink known as a tonic water. The so-called essence of quinine is known to contain 120 gr. of quinine sulphate to the ounce. Therefore, he consumed not less than 200, but apparently 240 gr. of quinine. After taking the "essence" he laid down; later a comrade went to see how he was, whereupon the

patient rose up, staggered round the room, and said that he could hear nothing. A stretcher was sent for and the man promptly taken to hospital.

On admission to the hospital, approximately one and a-half hours after taking the essence, he was in a comatose state, the breathing stertorous, the pulse barely perceptible, pupils equal but widely dilated, no corneal reflex, and the body cold and clammy. Ether and strychnine were given hypodermically and hot water bottles applied to the extremities. The patient rapidly became worse and markedly cyanosed. Artificial respiration was at once commenced and continued for three-quarters of an hour. In spite of all efforts he died just an hour after admission. No autopsy was made.

This case is of interest, apart from its rarity, in that it conforms to the accepted lethal dose of quinine, which is put at from 220 to 240 gr. It is particularly unfortunate that no autopsy was made, as it leaves unsettled the possible escharotic or other irritative action of the "essence" on the upper parts of the digestive tract. The record too is unsatisfactory as it gives no information as to whether the respiratory or cardiac action ceased first, neither is there any record as to whether the post-mortem production of heat in the cadaver was at all diminished. The sequence of pathological events in this case are easy to follow in the light of Binz's well-known work on quinine. If we suppose that quinine produces an effect upon the protoplasm of cells composing the tissues of the body similar to what it has upon leucocytes, we can appreciate how it must lessen oxidation in the tissues and have also an action on the tissues themselves, and especially a contractile effect on the protoplasm of the cells in the brain and spinal cord. The actual cause of death in this and other cases of the kind would appear to be exaggerated and acute cell asphyxia, this interference with oxidation involving not only the general tissues, but also those of the higher nerve centres, particularly the respiratory centre, the failure of which to be able to respond, is the true cause of death.

Echoes from the Past.

THE BEGINNING OF THE P.M.O.

By Colonel A. Peterkin.

The recent dropping of the old title, Principal Medical Officer, in favour of a newer term, affords an opportunity of referring shortly to the original use of the expression and to some peculiarities in its application, gleaned from the "Fifth Report of the Commission of Military Enquiry," dated 1808.

The title is not of more than respectable antiquity, dating as it does from 1798, and it did not, at the time of its origin, denote a senior administrative appointment as in recent years, but an actual rank bearing extra pay.

When the title was first introduced, the Principal Medical Officer was the senior Medical Officer of a General Hospital, and not the Senior Medical Officer of a Regimental Hospital; he might be any junior Officer of the Hospital promoted to the rank over the heads of all the Staff, however senior. The only limitation was that neither Inspectors nor Deputy Inspectors of Hospitals were accorded the rank, nor could they draw the 5s. per day extra pay.

The Staff of a General Hospital usually included Physicians, Staff Surgeons, Purveyors, Apothecaries, Deputy Purveyors and Hospital Mates, and any of these might be appointed P.M.O.

I may here mention that at the end of the eighteenth century General Hospitals had been established at Gosport, Plymouth, Deal and Chelsea (York Hospital), the number being increased in later years, and in turn reduced until in 1807 there were but two left.

They were much larger and more important charges than the Regimental Hospitals, in which from the circumstances of the case there was a certain continuity of rule. In the General Hospitals when the senior Officer left for any reason such as foreign service, &c., it would appear that chaos reigned, or at least, was dreaded, the next senior Officer being considered absolutely incapable of carrying on the duties, as he had in the words of the official report on the subject "everything to learn," and this too when the next senior Officer referred to might be a senior Physician or a Staff Surgeon of many years' service. To quote the official record again, "therefore a proper person from any rank was chosen whose pay as well as rank were perhaps inferior to others under his direction

in the same Hospital, and for this, and other reasons, it was judged expedient to give him a superior title and authority . . . with the addition of 5s. a day."

It was specifically mentioned that the person chosen might come from the ranks of Physicians, Surgeons, Apothecaries or even Hospital Mates, as happened in at least one case.

What the "other" reasons were which affected the case, we are not informed, but some may be imagined.

The filling of these appointments rested at first with the Army Medical Board (the Surgeon-General, Physician-General and Inspector of Hospitals), but very soon it was vested in the Surgeon-General alone.

The system of selection by the Board must have begun very early in 1798, as we find by March of that year it had ceased, and the Surgeon-General's nomination alone was required, and it must have been then that the term Principal Medical Officer came first into use, in lieu of "Superintendent" "Senior" and "Head," which had been in turn used for the Senior Medical Officer, after the system of General Hospitals was established in England, in 1793. Such Hospitals hitherto had been reserved for use on foreign expeditions.

By 1807, however, there were but two General Hospitals left, one at Chelsea, under a Principal Medical Officer, the other in the Isle of Wight, under an Inspector of Hospitals, who had not the special title. In the case of the Chelsea (York) Hospital appointment, in that year, the Principal Medical Officer was a Staff Surgeon of four years' service as such, who had under his command a Physician of fourteen years' service, and a Staff Surgeon of eight years' service in the rank, with a further staff of Apothecaries, Purveyors and assistant Purveyors.

It may be that this Staff Surgeon of 1807 was but a Hospital Mate in 1803 when he got the appointment, the York Hospital being specified as that where a Hospital Mate was appointed.

One can imagine the feelings of the Staff of a modern Military Hospital, consisting of Lieutenant-Colonels, Majors, and Captains of the Royal Army Medical Corps, were a Lieutenant of the Corps, corresponding to the Hospital Mate of earlier days, put in command.

The amount of tact, *savoir-faire*, &c., required on both sides to avoid friction under the circumstances, must have been considerable, if the friction were avoided, which one must take leave to doubt.

From the modern point of view, the cure may well have been worse than the disease and it would have been better to have permitted the officially distrusted second in command to shake down into the duties of the position, for which at all events, he was as likely to be fitted as a Hospital Mate or Purveyor; but there were these "other" reasons!

Of the thirteen General Hospitals established between 1793 and 1803 in England, the responsible heads were:—

Inspectors of Hospitals		3
P.M.O.	Assistant Inspectors	2
	Physicians	2
	Staff Surgeons	3
	Surgeon	1
	Purveyors	2

Purveyors being then, of course, Medical Officers.

The attention of the authorities was directed by the Commission of 1808 to the anomalies of the system, and disapprobation was expressed, but no special recommendation was made, as the General Hospital system itself was dying out, and no new appointments were made.

About this time, moreover, it would appear that the title began also to be used in its modern sense.

Among the Medical Officers on full pay in 1805, shown in an appendix to the Report, one of them is shown as Principal Medical Officer at Gibraltar, while most of the Inspectors and Deputy Inspectors of Hospitals are shown as "chief of the medical staff" or "Superintending Medical concerns" in their respective districts or Hospitals.

This can only mean the Senior Administrative Medical Officer, and seems the earliest official use of the term in its modern acceptation.

Reviews.

THE NAPOLEONIC CAMPAIGN OF 1805. By Captain F. W. O. Maycock, D.S.O., The Suffolk Regiment. Gale and Polden, 1912. Pp. ix. and 106. Price 3s. 6d.

This little book gives a short and extremely clear account of Napoleon's campaign against the Allies in 1805, culminating in the decisive battle of Austerlitz, which may be taken to constitute the answer returned by a predominating land power to the blow of the predominating sea power, given by Nelson at Trafalgar. The account is well written, and gives a clear view of the campaign as a whole to any officer wishing to study the details of any isolated incident. It is well illustrated by maps and plans, and can be confidently recommended to any medical officer desiring to acquire a knowledge of the conduct of war on the grand scale. C. H. M.

THE TECHNIQUE OF THE TEAT AND THE CAPILLARY GLASS TUBE. By Sir A. E. Wright, M.D., F.R.S. Constable and Co., 1912. Pp. xvi. and 208. Price 10s. 6d.

Those of us whose privilege it was to study under Wright at Netley are able to appreciate the debt under which lie all workers in humoral pathology to the inventor of the technique of the teat and the capillary glass tube. There must be many, however, who profit daily by these appliances without the least feeling of gratitude to anyone in particular, and to these we commend the little volume now under review. Given this book, a supply of glass tubing, teats, plasticene, and a blow-pipe flame, the limits of successful endeavour would seem to be indefinitely extended.

The author gives many ingenious applications of his technique, but like all Wright's work, the book not only teaches but inspires, and the reader is constrained to become an inventor in his turn.

The concise and pithy explanations are supplemented by capital teat-figures and plates. The book, in fact, brings vaccine therapy and blood examination within the scope of any medical man of average ability and industry, and will probably create as many immunizators as Cheyne and Burghardt's volumes created surgeons. We can only hope that they may all possess the high standards of morality laid down as requisite on p. 154, and that this introspection and self-examination (p. 158) may be safeguards to a public that is only too ready to take vaccine three times a day.

The portion of the book most calculated to evoke criticism is that dealing with the opsonic index. No serious worker with a personal familiarity with the subject can any longer doubt either the existence or importance of the opsonins as factors in immunity. The questions still at issue are whether Wright's method of calculating the opsonic index gives significant results, and whether, this being granted, it is necessary to supplement clinical observation by these laborious investigations in vaccine therapy. While convinced of the value of the test, we are constrained to admit that it is subject to many fallacies, and these not

only of the mathematical kind. Amongst the biological difficulties are the rapid digestion of many organisms after phagocytosis, and the quantitative limits imposed on the activity of a phagocytic mixture by the thinning of the bacterial emulsion necessary to ensure countable units. On p. 130 it is suggested that the tubercle bacillus is "foreign to the normal organism." If, as the context would seem to imply, the word "normal" here means "free from clinical signs of disease," we are obliged to recall the work of Nägeli and Burghardt and the tuberculin results of von Pirquet, which show that 80 or 90 per cent of apparently healthy European adults harbour latent or inactive tubercular foci. These observations have an important bearing on the question of "controls" in the tubercle opsonic index. The descriptions of the methods of calculating the coagulation "time," the calcium and magnesium salts in blood, and the saline content of urines, are excellent; there is also a useful summary of the principles underlying the Bordet-Gengou and Wassermann reactions, and the chapters on the preparation and standardization of vaccines leave nothing to be desired. We offer our hearty congratulations to the author on a book that is indispensable to every worker in the field of humoral pathology. S. L. C.

What to do in Cases of Poisoning. By W. Murrell, M.D., F.R.C.P. Eleventh Edition. London: H. K. Lewis, 136, Gower Street, W.C. Pp. 283. Royal 32mo. Price 3s.

This most useful book is now in its eleventh edition. It has been thoroughly revised and brought up to date, and many new poisons (including veronal) have been added. The arrangement of the subject-matter is highly practical. The Introduction deals with the Classification of Poisons, the Diagnosis of Cases of Poisoning, a most useful summary of the constituents of popular patent preparations, and concludes with a useful résumé of the means, both instrumental and antidotal, of treatment. The mode in which specimens should be preserved for examination, and the origin and nature of ptomaines are pointed out in a simple and practical manner.

The poisons themselves are arranged in alphabetical order, and grouped under two headings, viz., Acute Poisoning and Chronic Poisoning. The "acute" group is considered under the headings of (1) "How Taken," (2) "Symptoms," (3) "Fatal Dose," and (4) "Treatment." These are all given in a most concise and practical fashion, and the information is stated in such a way as to be of the greatest use in an emergency, where time is of value.

The section dealing with chronic poisoning differs necessarily from that of acute poisoning, as the symptoms presented and the treatment required are on somewhat different lines.

Amongst others, the results of the toxic action of cocaine, morphia, absinthe, arsenic, and lead as chronic poisons are described, and much valuable information is given bearing on treatment.

The publication itself is well printed, and though consisting of 283 pages is of small size, and can be readily slipped into the pocket. There is no doubt the book will be found a most useful one by medical officers. Owing to the alphabetical arrangement of the volume, and the provision of an index, the book lends itself to rapid reference in case of any emergency from poisoning. F. M. M.

THE REVIEW OF BACTERIOLOGY. By A. G. R. Foulerton, F.R.C.S., and C. Baker, M.A., M.D. Science Review, Ltd., London. Price 10s. 6d. per annum.

This publication purports to be "an epitome of recent literature of the parasitology and pathology of infective diseases and of laboratory methods," and if subsequent numbers fulfil the high promise of the first one this object will certainly be attained. Every British worker in the field of bacteriology must long have felt the need for an English review on lines similar to the *Bulletin de l'Institut Pasteur*, and this want would now appear to be supplied. A large number of articles on subjects of immediate interest are summarized in a manner that affords a very fair idea of their contents, thus enabling the reader to keep abreast of work done in many directions without taxing too severely the time at his disposal for the more minute study of the literature of his own particular subject.

The compiling of such a review involves an immense amount of reading, translation, and selection, and the editors and their assistants deserve the gratitude of everyone who wishes to keep his knowledge up to date and finds his own language the best vehicle for scientific information. We earnestly hope that the publication will receive the support that it so well deserves. S. L. C.

SPRUE: ITS DIAGNOSIS AND TREATMENT. By Charles Begg. Bristol: John Wright and Son. 1912. Pp. vi. and 124. Price 6s. net.

This is a book on the diagnosis and treatment of sprue by one who has had a large experience of the disease, and who appears to have been more than usually successful in the treatment of it. As is well known, Dr. Begg is an ardent advocate of the use of old yellow santonin in sprue, and it is to this that he attributes the results which he obtains. In his view sprue is due to a microbic infection of the intestine, which is very probable, though so far our knowledge as to the causation of sprue is *nil* and any ideas about it are pure surmise. He explains the action of santonin as being antiseptic; this may be so, though we cannot recall any experiments which show that the microbic content of the fæces is reduced after the exhibition of santonin. Many other observers have tried santonin in sprue and the majority have been disappointed; it may be that it was not old enough or not yellow enough, or we might be tempted to look for some other element in Dr. Begg's treatment which is necessary. This, however, seems to be excluded. When we read of a patient eating blackberry and apple pudding (with the permission of her doctor) after one week's course of santonin, we realize that he puts little faith in diet cures, though he uses diet as an adjuvant whenever called for. Those of us who have not had good results after the use of santonin in sprue will be encouraged to try it again after the perusal of this book, taking care, however, that the drug is very old and very yellow. For the rest the author gives many useful hints on the management of cases of this most troublesome complaint.

W. S. H.

POST-MORTEMS AND MORBID ANATOMY. By Theodore Shennan, M.D., F.R.C.S.Edin. London: Constable and Co., Ltd., 1912. Pp. xv and 496. Price 18s.

This work should prove of great value to all to whom it may fall to conduct autopsies, either as a routine practice or as an occasional

necessity. The author has designed it for the assistance of students, practitioners, and teachers of pathology, and also hopes that it may be of value to the practising pathologist and the investigator of pathological problems. It says much for the clear and systematic manner in which he has dealt with the subject that this widespread aim should have been so well fulfilled, for, while the student will find in the book an excellent guide to a subject with which he is expected to be familiar at his examinations, there are few chapters which may not be consulted with profit by the trained pathologist and the investigator. After very practical accounts of the best method of making a systematic autopsy and of the external examination of a body, the methods for displaying and examining the various cavities, organs, &c., are thoroughly dealt with, and a careful account is given of the different pathological conditions which may be encountered therein. These are profusely illustrated by photographic reproductions of naked-eye specimens, mainly from the author's own collection, or from the Museum of the Royal College of Surgeons of Edinburgh, and for the most part they are excellent illustrations of the alterations described in the text, and would be most helpful in actual practice. It is naturally impossible in a book of moderate price to include many coloured plates, but the few which are added are of so high a quality that one regrets their limited number, for however good a half-tone reproduction may be it is at best a poor substitute for a well-executed plate in the natural colours. The author expressly states that his account is confined to the naked-eye appearances, but one may be permitted to regret that he did not take the opportunity of placing alongside of his descriptions accounts and figures of the morbid histological changes in the tissues in the conditions with which he deals. This would have added considerably to the size of the book, and, without doubt, to the labour and expense involved in its production, but in our opinion such a co-ordination would have added greatly to its value, and would have been more in accordance with modern tendencies, and with the needs of both students and pathologists. The book is well printed and furnished with an excellent index and bibliography, while the appendix, dealing with methods of preserving specimens and furnishing comparative tables of measurements, &c., is of real practical value.

W. B. L.

THE CAUSE OF CANCER. By J. Jackson Clarke. London: Baillière, Tindall and Cox. Pp. xi. and 110. Price 7s. 6d. net.

This is a monograph upholding the view that cancer is of parasitic origin. It is a polemical pamphlet of a kind now happily rare. Mr. Clarke seems to attribute bias to those of his critics who do not agree with him in his interpretation of his specimens. Scientific questions are not settled in this way; if observations bear the face of truth this fact will be recognized sooner or later, and a man who produces a theory which does not meet with acceptance at first must needs seek further and find more evidence, until he has either convinced himself that he is wrong or has convinced his critics that he is right. To get cross about it does not help matters in the least.

W. S. H.

SIXTH ANNUAL REPORT OF THE HENRY PHIPPS INSTITUTE.

The greater part of this valuable Report deals with statistical matter accumulated, in most instances, over a period of seven years, and referring to the large numbers of cases of tuberculosis treated at the Institute. The tables furnish important information on many aspects of the disease, perhaps the most striking being those revealing the higher incidence amongst those taking alcohol, or indulging in tobacco, than in persons avoiding such luxuries. In some respects the statistics are, or appear, rather vague; for instance, where a high proportion of patients is shown to belong to the Celtic (27·7 per cent), the Jewish (20·3 per cent), and the Teutonic (19·8 per cent) races, the reader wonders whether the words Celtic and Teutonic are merely geographical or strictly anthropological expressions. The point is of importance, as the one reading would hint at an environmental, the other at an inborn or racial tendency to tuberculosis. We notice under "Nativity" a high admission-rate among people of Irish nationality, but Ireland is inhabited by a population of mixed race, and although there is a strong Celtic element, especially in the south and west, it would, we think, be rash to claim a racial susceptibility for the Celt on the ground of a high case-incidence amongst Irish immigrants. Again, we are often at a loss to grasp the actual significance of the figures in some of the tables. For instance, under "Occupation" we find that 1,334 houseworkers were admitted for tubercular disease during seven years, while only 19 hucksters came under treatment in that period; but without an idea as to the relative proportions of houseworkers and hucksters in the community we are still at a loss to know which trade is the more liable to the disease. The Report contains several papers of high interest, such as that on "The Relation of Intestinal Absorption to Pulmonary Anthracosis," by C. M. Montgomery, in which the author records his failure to find pigment granules in the lungs after feeds of lamp-black and "Prussian blue" made up in cakes to avoid inhalation of particles during ingestion of food. Dr. Joseph McFarland contributes a paper recording attempts to discover tubercle bacilli in the blood of fifty-six cases, the method of Rosenberger being employed. The results were negative in all the genuine tubercular cases except two. Acid-fast bacilli were, however, found in the blood of two tubercular cases, in one case of pneumonia, and in two cases of epidemic cerebrospinal meningitis. This finding aroused suspicion, and, in view of the work of Brem on this subject, the distilled water was carefully examined, albumin being used to fix the preparations, with the result that it was found to contain numerous acid-fast bacilli. The author concludes that tubercle bacilli do not constantly circulate in the blood of tuberculous individuals.

S. L. C.

Current Literature.

The Practical Value of the Ross "Thick-Film" Method.—W. M. James (*The Southern Medical Journal*, October and November, 1911) has contributed a paper which embodies the results of much work on an immense amount of material. Between January, 1905, and September, 1911, 41,000 cases of malaria were admitted to Ancon Hospital, Panama Canal Zone, in 58 per cent of which parasites were detected. W. M. James has increased the percentage of positive results to 94 by a five-minute's search in a thick film of blood which he thus prepares:—A drop of blood, larger than that which, when smeared, would cover the greater part of the slide, is spread on its surface until it makes a circle about three-quarters of an inch in diameter. About 7 c.mm. of blood is contained in the drop. Between forty and sixty leucocytes are seen in each microscopic field. It is useful to make two such smears on each end of the slide. A platinum loop, a pin, or the concave surface of a pen may be employed. The film should be made as evenly as possible. The slide is then placed on a flat surface, and allowed to dry. The name of the patient is scratched on the film with a fine point.

The slides are placed in methylated spirit, or spirit of wine, to which commercial hydrochloric acid has been added in the proportion of twenty drops to 100 c.c. The hæmoglobin is dissolved. Decolorization is complete in ten or twenty minutes, and the film resembles ground glass in appearance. No damage results from a longer stay in the acid alcohol, which may be used repeatedly. The slides are washed in running tap water for ten or fifteen minutes, insufficient washing prevents staining; they are then dried by blotting or exposure to air, but not by heat. Leishman's stain is poured on, and left for two or three minutes, so that it may penetrate the thick film. Distilled water is added; after a few minutes more distilled water is added, and five minutes later the preparation is diluted with distilled water, and washed in tap water until the washings are no longer blue but not taking out too much of the stain. The field appears pink, the cytoplasm of the parasite blue, and its chromatin red. The small ring forms are seen at many angles—sometimes only a chromatin dot and a speck of cytoplasm are visible. The larger tertian parasites appear as ragged masses of blue, in which red dots are scattered. These sometimes give rise to difficulty in their identification. Crescents, though shrunken, are recognized by their pigment and chromatin. Tertian gametes are easily seen. Quartan parasites are compact, their cytoplasm is dark blue. Presegmenting and segmenting forms present no difficulty in their detection. It is not possible to recognize the species of the ring forms. But if all the parasites in the film are rings, it is probable that the infection is æstivo-autumnal. In tertian and quartan ague larger parasites and gametes are generally present. By means of this thick-film method, plasmodia may be found in the blood for three or four days after the administration of quinine. In the tertian and quartan infections the parasites are most numerous about twenty-four hours before the acme of the fever, in the æstivo-autumnal, at the beginning of the apyrexia. Uncomplicated malaria does not cause ague attacks unless the parasites are present in the peripheral blood in numbers sufficient for their demonstration by the

thick film process. The degree of pyrexia is usually proportional to the number of plasmodia. In a continued fever, if malarial parasites cannot be found within the first twenty-four hours, and if there is no obvious cause for the pyrexia, enteric should be suspected, and blood cultures should be made. Even when parasites are present at the outset of a continued fever of three or more days' duration, the case should still be regarded with suspicion. Such fevers lasting five or more days are usually infectious, one of the typho-colon group of bacilli being present. Atypical cases which remain undetected are instrumental in the spread of these bacterial diseases. C. B.

Dysentery in Fiji.—Bahr, in Supplement No. 2 of the London School of Tropical Medicine, describes the results of his investigations on dysentery in Fiji in 1910. He finds that the majority of cases are bacillary in origin, though a few amœbic cases occur. The bacteria concerned are chiefly of the Shiga and Flexner types, but others, atypical as regards their cultural reactions, were found in a few cases. He states that the sugar reactions were variable and inconstant after long subculture. This does not appear to be borne out by his protocols, where only two out of the seven strains isolated show variation on subculture; one of them fermented saccharose and maltose when first isolated and lost these properties after seven months subculture, reverting to a typical Shiga. The other, which he labels type G, fermented mannite, lactose, maltose and dextrose, and formed indol when first isolated. After three months it temporarily lost its action on maltose, which it regained after four months, at the same time losing its reaction with lactose. He also says that agglutination tests with patients' sera proved neither constant nor reliable; 74 per cent gave a reaction in dilutions of 1 : 100 to 1 : 200, whilst 5 out of 80 patients who were not suffering from dysentery gave a reaction in 1 : 50. He attributes a large part of the spread of the disease to flies, and has succeeded in isolating Shiga's bacillus from the alimentary tract of flies caught in the dysentery ward; experiments went to show that an infected fly could carry dysentery bacilli in its gut for five days. Polyvalent anti-dysentery serum given intravenously gave the best results in treatment. In the amœbic cases, the organism was *Entamœba histolytica*.

The report is prefaced by a history of dysentery in Fiji, written by Dr. B. Glanvill Corney. W. S. H.

Surgical Treatment of very Severe Dysentery.—Herrick (*Medical Record*, November 13, 1909), reports the results of eleven cases of very severe dysentery, in which he performed a right-sided colotomy. Four recovered, though all were apparently in a desperate state before operation. W. S. H.

Bone Changes in Diagnosis of Leprosy.—Herrick and Earhart (*Archives of Internal Medicine*, June, 1911, vol. vii, pp. 801-811) describe the bone changes which occur in the digits in anæsthetic leprosy. The terminal phalanges are especially affected, though the other phalanges and even the metacarpal bones may be involved. The changes are of two kinds, one a gradual absorption of the distal phalanx from one end, the other a general thinning and absorption of the whole bone. The changes may appear quite early and are then of great help in diagnosis, being quite characteristic of the disease. W. S. H.

Acute Tropical Phagedænic Ulcer.—Schüffner (*Arch. f. Schifts. und Tropen. Hyg.*, 3 Bd. 16, 1912, p. 78) has not confirmed the favourable results with salvarsan reported by Werner in tropical phagedæna. This condition is associated with the presence of *Spirochæte schaudinni* and *B. fusiformis*, though it has yet to be proved that they are the causative agents. Unfortunately animal experiments have failed. Prowazek was unable to convey the infection to apes and orang-outangs by inoculating these animals with the discharges of the ulcers. Leber made unsuccessful experiments on the cornea of baboons. Schüffner himself has had only negative results. He has employed salvarsan in three cases. The remedy caused no improvement in any of them. He finds that tropical phagedæna is readily amenable to surgical measures. He cuts off the sloughs, without scraping the ulcer, applies lead lotion or hydrogen peroxide compresses every four or six hours. A change for the better will be visible on the following day. Occasionally he lightly cauterizes the surface with chloride of zinc. The base of the sore will be clean in four to six days, and healing will then progress rapidly.

Cammermeyer (*id.* p. 85) treats the subacute phagedænic ulcers of the Congo, known by the local name of "sarnes," by washing with water, painting with tincture of iodine and dusting with powdered scharlachroth, and applying dry dressings. Healing is rapid. C. B.

Salvarsan in Anthrax.—Schuster (*Münch. med. Woch.*, February 13, 1912, p. 349) has ascertained that the injection of salvarsan in a dose of 0·04 grm. per kilogramme of body weight will save rabbits from an otherwise fatal infection with anthrax.

Bettmann and Laubenheimer (*Deutsch. med. Woch.*, No. 8, 1912) have found that salvarsan protects guinea-pigs when injected up to twenty minutes after inoculation with anthrax. The animals which survive have not acquired immunity. They report two cases of anthrax in men which recovered under the administration of salvarsan. C. B.

Salvarsan in Yaws.—Strong (*Philippine Journ. of Science*, October 4, 1910) reports the cure of twenty-four cases of yaws by means of salvarsan. The average periods after the injection, before recovery was complete, was ten days. No recurrences or nerve sequelæ were noted.

Flu (*Münch. med. Woch.*, No. 45, 1911) has cured 700 patients suffering from yaws with "606." Recovery was so rapid that second injections were necessary in only six instances. There were three relapses. Four cases of "pian" which were of long standing and were rebellious to other remedies yielded at once to salvarsan.

Alston (*Brit. Med. Journ.*, p. 268, January 6, 1912) has employed intramuscular injections of 0·6 grm. salvarsan in 500 cases of yaws; 498 were cured: 409 with one; 75 with two, and 14 with three doses. There were five recurrences. No eye or ear complications were observed. C. B.

Salvarsan in Scurvy.—Tuschinsky and Iwaschenzow (*Münch. med. Woch.*, December 12, 1911, p. 2671) have given "606" intravenously to eight scorbutic cases as Rumpel and Gerber have demonstrated the specific action of this remedy on the spirochætes of the throat in Vincent's angina, and Henke the same effect on saprophytic spirochætes. In the spongy ulcerated and bleeding gums of scurvy these micro-organisms are very numerous. The patients improved immediately. Bleeding from

the gums ceased and the mouth was in a normal condition in a week. The spirochætes disappeared for a time, but subsequently they could be found in small numbers. Their reappearance was not associated with a relapse of the mouth ulceration. C. B.

Salvarsan in Malaria.—Weintrraud (*Berl. klin. Woch.*, February 12, 1912, p. 325) relates a case of tertian ague which was cut short by 0·4 grm. "606" intravenously. Though doses of 0·4 and 0·7 grm. were again given, a relapse occurred in three weeks time which was uninfluenced by quinine. Two more doses of 0·4 grm. of salvarsan were administered with good effect. Ague attacks came on some weeks later which were cut short by salvarsan. He recommends that cases of ague which prove to be rebellious to quinine, should be treated by weekly injections of salvarsan.

Postempky (*Münch. med. Woch.*, 1911, p. 2693) has given salvarsan with benefit to five chronic malarial cases. C. B.

Salvarsan in Kaposi's Disease.—Sgambati (*Münch. med. Woch.*, 1911, p. 2693) has seen the cutaneous sarcomata of Kaposi disappear after two doses of "606." C. B.

The Wassermann Test in Tropical Diseases.—Schüffner (*Arch. f. Schiffs. und Tropen. Hyg.*, H. 3, Bd. 16, 1912, p. 83) states that fallacies arise if a watery extract of syphilitic liver is employed. He recommends that an alcoholic extract of human heart should be substituted. Eighty per cent of the cases of tropical ulcer gave a positive reaction with the liver extract, but a negative one with the heart extract. In malaria 74 and 8 were the respective percentages, and in leprosy 78 and 22. Hence the watery syphilitic liver extract causes a high ratio of non-specific positive responses. C. B.

Wassermann Reaction in Lead Poisoning.—Hilgermann (*Münch. med. Woch.*, January 30, 1912, p. 274) has not obtained a positive Wassermann reaction in the blood of thirty-five cases of plumbism. He is thus unable to confirm the statements of Dreyer and Schnitter. C. B.

The Effects of Salvarsan on the Wassermann Reaction of Rabbits.—Emanuel (*Berl. klin. Woch.*, December 25, 1911, p. 2325) has tested the effect of salvarsan injections on the positive Wassermann reaction which so frequently may be obtained with the blood of normal rabbits. He finds that under the "606" a positive response changes to a negative. He therefore suggests that a negative reaction of the blood of an infected patient who has received salvarsan cannot be accepted as proof of the therapeutic value of the remedy without corroborative evidence. He alludes to the fact that the serum reaction in general paralysis of the insane may alter from positive to negative after salvarsan, though the course of the disease is unchecked. C. B.

Significance of a Negative Wassermann Reaction.—F. Müller (*Berl. klin. Woch.*, February 12, 1912, p. 326) states that a negative phase which may continue for twelve or fifteen months is no guarantee that recrudescences will not take place. There are instances in which the blood has responded negatively to the Wassermann test for one or two years, after which it has again become positive. C. B.

Wassermann Reaction in Mothers and Offspring.—Heimann and R. Stern (*Münch. med. Woch.*, January 23, 1912, p. 209) state that the Wassermann reaction is equally reliable in women whether they are pregnant or not. Blood tests have disproved the validity of Colles' and Profeta's laws. Colles thought that the mother of a syphilitic child often showed no signs of infection and that therefore she escaped. Profeta noted that the apparently healthy child of a syphilitic mother does not acquire the disease.

Reuben (*Arch. of Ped.*, June, 1911) has found that mothers with no specific signs, who give birth to syphilitic children have syphilis in the latent form, for the blood in 71 per cent of them gives a positive Wassermann reaction. Similarly he has shown that the blood test is positive in 99 per cent of the offspring of syphilitic mothers. C. B.

The Diagnostic Significance of the *Treponema pallidum.*—Hoffmann (*Deutsch. med. Woch.*, February 15, 1912, p. 313) dwells on the importance of examining not only primary but also secondary lesions for the presence of the *T. pallidum*, more especially when the Wassermann reaction is negative. He quotes a case in which excision of the sore and intensive mercurial treatment were apparently successful in aborting the disease, for the blood test remained negative. Nevertheless, three and a-half months after infection, mucous patches appeared on the tonsils and elsewhere in the mouth from which treponemata were obtained. It was not until several weeks later that the blood gave a positive response. In another instance, a woman was treated with salvarsan and mercury under which the Wassermann reaction became negative. Ulceration of her throat recurred in two months, while the blood was still negative. The detection of treponemata in scrapings from her fauces led to a correct diagnosis. A patient was suffering from a pustular eruption which was not suggestive of lues and had resisted specific treatment. The Wassermann reaction was negative, yet the true nature of the case was disclosed by finding the treponema in the rash. He thinks that negative results, if repeated often enough, are useful, for he was able to recognize cancer of the penis in its earliest stage in this way.

For the treatment of syphilis he recommends four or five intravenous injections of 0·4 grm. of salvarsan at five to seven days' interval, combined with thirty-six mercurial inunctions, or twelve salicylate of mercury injections. In late, neglected, or rebellious cases, he uses, in addition, calomel injections (0·05 grm.). Nerve affections may arise after the combined treatment, but they are less numerous than after salvarsan alone. He attributes them to a local reaction of a treponema focus in the nerve. Ehrmann and he have demonstrated treponemata among nerve fibrils sometimes even before the outbreak of secondaries. They have shown by experiment that they are present in the blood three weeks before the beginning of the secondary stage. C. B.

The Combined Treatment of Syphilis.—Scholtz (*Deutsch. med. Woch.* February 15, 1912, p. 311) has employed salvarsan in a thousand cases of syphilis. He recommends that 0·6 to 0·8 grm. divided into two or more doses should be given intravenously. Mercurial treatment should be pursued with energy and another course of 0·6 to 0·8 grm. "606" should be begun three to five weeks after the first. He states that when the dose injected exceeds 0·4 grm., a not inconsiderable portion of the remedy is

excreted unchanged. Of seventy primary sores thus treated, sixty cures resulted, secondaries came on in seven, and the Wassermann reaction only became positive in the remaining three. In 122 early secondary cases, 89 showed no further signs and the blood reaction became negative. These were kept under observation from four to twelve months, 19 suffered from relapses, but in 7 of them treatment had not been sufficient. Of 72 cases of latent lues, in 64 the Wassermann reaction became negative. Out of 36 sufferers from tertiary lesions, 15 recovered. In seven of them the blood reaction continued positive, in spite of intensive treatment with salvarsan and mercury, though he states that the combined method is successful in converting a positive into a negative reaction in 70 per cent of all syphilitics so treated. He admits failure in checking symptoms or annulling a blood reaction in 9 per cent of primary, in 14 per cent of secondary, in 40 per cent of tertiary and in 5 per cent of latent syphilis. The period of observation ranged from four to sixteen months. He noted nerve sequelæ eight times in 375 cases. He considered them to be of specific origin, since they mostly disappeared under larger doses of salvarsan. C. B.

Poisoning by Wood-spirit. — Hirschberg (*Berl. klin. Woch*, January 25, 1912, p. 247) gives abstracts of reports of the effects of drinking methyl alcohol. Three hundred cases of blindness and 150 deaths have been recorded. Eight grammes may cause optic atrophy in a few hours, while 30 grm. may be followed by death. Should an explosive outbreak of cases occur among the poorer classes who are accustomed to imbibe cheap spirituous liquids, in which the symptoms are syncope, vertigo, chilliness, sweating nausea, vomiting, abdominal pain, somnolence passing into coma, sudden loss of sight, dilated and fixed pupils, death in a few hours, then poisoning by methyl alcohol should be suspected.

Lewin (*Berl. klin. Woch.* February 12, 1612, p. 309) states that methyl alcohol lowers the temperature of animals and causes fatal coma.

C. B.

Bacteria in Distilled Water.—Professor P. T. Müller (*Münch. med. Woch.*, No. 51, 1911) gives a short account of the results obtained in a number of samples of distilled water purchased at different chemists' shops in Gratz. He estimated the number of bacteria present by precipitating all the bacteria in 100 c.c. of the sample by means of a solution of oxychloride of iron. The precipitate was then stained with concentrated gentian violet, and centrifuged; the number of bacteria was estimated by microscopic examination of a portion of the precipitate. Altogether twenty samples were examined, sixteen of these were purchased in shops, and four were from distilled water prepared in the institute of hygiene. Müller estimated that the lowest bacterial content per cubic centimetre was 68,000, and the highest 6,050,000. This includes dead as well as living bacteria. Müller points out that according to the above results, in an intravenous injection of salvarsan, when 200 to 300 c.c. of distilled water is used, the number of bacteria injected would vary between 6 million and 1,500 millions. C. E. P.

Guaiacol in Typhoid Fever.—Lacroix (*Gazette Médicale de Paris*) advocates the use of guaiacol as an antipyretic in cases of typhoid fever with a high temperature. He recommends that a few drops of guaiacol should be painted over the front of the thigh, and a piece of jaconet fastened over the painted area. The patient's temperature should be

taken two hours later. He claims that the action of guaiacol is effective and safe, and that it does not cause any dangerous collapse.

C. E. P.

Extract from the Report of the U.S. Army Board for the Study of Tropical Diseases as they exist in the Philippine Islands, Quarter ending June 30, 1911.—By Major Weston P. Chamberlain, Medical Corps, U.S.A.; Captain Edward B. Vedder, Medical Corps, U.S.A.; Lieutenant John R. Barber, Medical Corps, U.S.A. (*The Military Surgeon*, No. 4, April, 1912).

. . . .

"FURTHER STUDIES OF POLYNEURITIS GALLINARUM.

"As a result of the series of experiments, we were able to arrive at the following conclusions:—

"(1) Polyneuritis gallinarum is not prevented by adding to a diet of polished rice any of the following substances: potassium phosphate, potassium citrate, potassium carbonate, potassium chloride, magnesium phosphate, phytin, phosphoric acid, or phosphoric acid combined with potassium chloride.

"(2) The neuritis-preventing substance in rice polishings is soluble in cold water and in cold alcohol.

"(3) Polyneuritis gallinarum may be prevented by means of an extract of rice polishings containing only those substances soluble in cold water and cold alcohol. This extract, so far as at present known, has the following composition:—

Total solids	1·34	per cent.
Ash	0·03	,,
Phosphorous pentoxide	0·00165	,,
Nitrogen	0·0406	,,
Sucrose	0·88	,,

"(4) Multiple neuritis in fowls fed on polished rice is probably not due to lack of phosphorus compounds in the grain, as claimed by Schaumann, since out of each 1,000 parts of phosphorus contained in the rice polishings, at least 999 parts are not concerned in preventing neuritis.

"(5) The neuritis-preventing substance contained in rice polishings is capable of dialysis through a parchment membrane. This excludes all colloids from consideration."

. . . .

"THE FINDING OF A MARKED SHIFT TO THE LEFT IN THE ARNETH COUNT OF FILIPINOS.

"(1) Both Filipinos and Americans residing more than a year in the Philippines had a normal average number of white cells per cubic millimetre.

"(2) In both races the percentage of polymorphonuclear neutrophiles was much decreased below the minimum considered normal for white men in temperate regions.

"(3) Probably the polymorphonuclear neutrophiles are the only actively phagocytic cells in the circulating blood.

"(4) The average Arneth picture showed a marked shift to the left in the case of Filipinos, and a slight drift in the same direction for Americans resident more than a year in the Philippines.

"(5) A shift to the left in the Arneth count probably indicates a diminution in the phagocytic power of the blood in question.

"(6) From the first five conclusions, it will be apparent that the Filipinos show an actual absolute reduction in the number of polymorphonuclear neutrophiles (phagocytes), and that of this reduced number an abnormally large proportion are deficient in phagocytic power. In other words, the Filipino has absolutely fewer efficient phagocytes than are found among white men either in the Philippines or at home.

"(7) This reduction in circulating phagocytic cells may be a visible indication of a lowered resistance to infections on the part of native races.

"(8) No material differences in the differential count or the Arneth picture were observed between two groups of American soldiers, one group consisting of twenty-eight pronounced blonds, and the other group of twenty-eight pronounced brunettes."

Health of the Prussian Army (including the Saxon and Württemberg Army Corps).—A preliminary report for the period October 1, 1910, to September 30, 1911, has been published in the *Deutsche Militärärztliche Zeitschrift*, No. 6, 1912, from which the following notes are taken.

The ratio per 1,000 of strength, of admissions to garrison and barrack hospitals was 589·1; this shows an increase of 25·3 as compared with the preceding year. The principal increases were 4·9 in diseases of the alimentary tract, 8·3 in diseases of the organs of respiration, and 10·4 in the group of infectious and general diseases.

The mortality rate among patients undergoing treatment was 1·5 per 1,000.

The total number of deaths which occurred both in and out of hospital was 1,071 = 1·9 per 1,000 strength; this is an increase of 0·2 over last year's ratio. The ratio was made up of: Deaths due to disease, 1·2; deaths due to accident, 0·32; deaths caused by suicide, 0·43. Each of the three groups showed a slight increase over last year's figures.

The total number of men discharged from the army on account of physical unfitness was 22,314 = 40·4 per 1,000 of strength.

C. E. P.

Annual Report of the Bavarian Red Cross Society's Voluntary Aid Detachments, for the year 1910-11. (*Der Deutsche Kolonnenführer*, No. 24, 1911).—The number of voluntary aid columns is 185; the number of medical officers, 328; the number of active members (not including M.O.s), 8,988; the number of honorary members, 26,200

During the year thirty-seven men were trained in nursing in the military hospitals.

The preparations for mobilization in case of war have been steadily advanced, by the purchase of necessaries and by the revision of mobilization plans. In case of war the number of men available for duty on the L. of C. is 2,092, which includes 210 male nurses, and 87 men trained in disinfection work; there are also 1,304 for service in the home territory and 2,071 for duty at their places of residence.

The following units are organized and ready for service: *For L. of C.* eight sick transport columns with equipment and vehicles, five convoy sections and a depot section, two ambulance trains.

For the Home Territory. Two convoy sections and two half convoy sections are available, these have sixteen ambulance wagons, a large

number of tents, huts, cooking utensils and stretchers are also ready in store.

Preparations have also been made to afford assistance in case of disasters, epidemics, &c., occurring in the civil population during peace time. These arrangements proved of great value in the case of the conflagration in Teuschnitz, by which 201 people were rendered homeless. The society, on receipt of a telegram, dispatched by express train bedding for sixty persons, and £50 worth of food-stuffs.

All members of the voluntary aid columns are insured in the "Allianz" society against the risk of injury while employed on any voluntary aid training or in assisting the public; the premium paid appears to be Mk.0·28 (= 3 pence) per head per annum. [The compensation payable is not stated, but is probably that laid down in the (German) Employers' Liability Act.]

C. E. P.

The French Hospital at Fez.—*Le Caducée*, February 3, 1912, contains a short account of the French hospital established at Fez. The construction of a hospital was decided on in 1905. Dr. Murat, who had previously had considerable experience at Mogador, was selected as superintendent, and he was given £160 a year for hospital expenditure.

After much difficulty a site was obtained from the Sultan, and the sum of £800 granted for construction. By the exercise of economy and ingenuity Dr. Murat succeeded in establishing a hospital with twenty beds, operating room, out-patient room, bacteriological laboratory, &c.

The grant for current expenses was later on raised to £320 per annum; this is, however, only sufficient to pay for a very limited staff. Some 32,000 out-patients are treated during the year and roughly one-third of the beds are constantly occupied. The principal diseases are malaria, typhoid fever, dysentery and small-pox.

The heavy rains during last year left numerous pools which undoubtedly caused a great increase in the incidence of malaria. Typhoid fever is mainly due to the use of water from the Oued of Fez; the stream is remarkably pure at its source, but in its course through the plain of Sais it passes several villages where the water becomes contaminated with fæcal matter. In places the stream forms marshes in which myriads of mosquitoes breed. By regulating its channel and enforcing some elementary sanitary laws both typhoid and malaria would be very much reduced, and the health of all in Fez would benefit.

The introduction of compulsory vaccination is also highly desirable.

C. E. P.

Voluntary Aid Detachments of the Red Cross Society, Rhine Provinces.—The following extract is taken from the report of the Annual General Meeting, held on July 2, 1911 (*Der Deutsche Kolonnenführer*, No. 2, 1912).

In the Rhine provinces there were, at the date of the meeting, 237 voluntary aid detachments with a total membership of 6,000. The number of detachments raised in each district was: Aachen, 19; Coblenz, 36; Cologne, 35; Dusseldorf, 99; Trier, 48.

In case of mobilization the following personnel was available:—

	For Transport		Sick Attendants.		Depot Work	
	L. of C.	Home territory	L. of C.	Home territory	L. of C.	Home territory
Aachen	76	83	8	2	—	—
Coblenz	81	113	9	3	1	—
Cologne	231	136	32	2	2	2
Dusseldorf ..	455	596	27	21	8	3
Trier	182	261	53	13	7	7
Total ..	1,025	1,189	129	41	18	12

C. E. P.

Voluntary Aid Detachments in Germany.—Dr. Sigmund Merkel (*Der Deutsche Kolonnenführer*, No. 1, 1912) gives a description of the headquarters building erected by the Voluntary Aid Detachment in Nürnberg.

The building consists of a single-storied drill hall 93 ft. long by 49 ft. wide with a smaller class-room and a committee room alongside it; the latter are shut off by sliding doors. Another room is at present fitted up for refreshments and social intercourse, but can be used as a class-room. All the rooms are lighted by gas and warmed by patent stoves. A covered passage is used as a garage for an ambulance motor wagon. There are also rooms for the personnel on duty and a completely equipped operating room. A three-storied building adjoins the drill hall. The first two floors contain class-rooms, while the third is used as quarters for the Sisters of the Red Cross Society. The basement is fitted up as a workshop for members to practise the improvisation of medical and surgical equipment.

Another building has a similar workshop in the basement; the ground floor can accommodate eight ambulance wagons. On the first floor uniforms and mobilization equipment are stored. The second floor is used for keeping reserve articles and equipment belonging to the women's branch of the Red Cross Society.

In the courtyard there is a ditch and a hedge over which bearers are taught to carry loaded stretchers. There are also two disused railway goods vans for practising the fitting up of hospital trains. The Nürnberg detachment is a very strong one, hence the elaborate arrangement of its headquarters.

C. E. P.

Sanitätskolonnen at Reviews.—*Der Deutsche Kolonnenfuhrer* (No. 1 of 1912) published a letter from the German War Office giving permission for the men's voluntary aid detachments of the German Red Cross Society to take part in Imperial reviews. The privilege is restricted to those detachments which are organized to supplement the medical services in war and the men must be clothed as laid down by regulations. Provincial delegates of the Red Cross Society must communicate with the district Army headquarters, where the necessary arrangements will be made. Detachment banners will not be carried on parade.

C. E. P.

Correspondence.

NOTES ON FRACTURE OF THE ASTRAGALUS.

TO THE EDITOR OF "THE JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—With reference to the Notes on "Fracture of the Astragalus" in this month's Journal, and the accompanying skiagram: surely the condition represented is one where the process of bone, the os trigonum, has remained throughout life as a distinct bone, instead of becoming attached to the astragalus. The condition, I believe, is a well-recognized one now, and is seen in skiagrams of ankles where there has been no injury.

I am, &c.,
T. S. COATES,
Captain, R.A.M.C.

LIFE OF JOHN HUNTER.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—There are a few mistakes in Major Howell's very interesting sketch of John Hunter, published in your last number, which I feel sure the author will pardon my pointing out in the interest of historic accuracy.

Hunter never was an Inspector General of Hospitals. On the death of Robert Adair, which occurred on March 16, 1790, Hunter was appointed Surgeon General and Inspector of Regimental Hospitals (notification in *London Gazette*, dated War Office, March 20, 1790). His previous commission was that of Assistant Surgeon General, not Deputy Surgeon General (notification in *London Gazette*, dated War Office, January 14, 1726). The title of Inspector General of Hospitals was first used on the appointment of Mr. Francis Knight, who succeeded Mr. John Rush as Inspector of Regimental Hospitals in 1801 (*Fifth Report of the Commissioners of Military Enquiry*, 1808, page 7).

Sir James M'Grigor was not our first Director General. Mr. John Weir, his immediate predecessor as head of the Medical Department, enjoyed the same designation from February 24, 1810 (*London Gazette*, February, 1810, No. 16345, p. 287).

I am, Sir, &c.,
W. JOHNSTON,
Colonel.

Newton Dee,
Murtle, Aberdeenshire,
August 22, 1912

ERRATUM.

In Colonel Johnston's letter on page 388, the date of the notification in the *London Gazette*, mentioned in the eleventh line, was incorrectly printed "1726" instead of "1786."

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[illegible]

Journal

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Original Communications.

PRELIMINARY NOTE ON IMMUNIZATION AGAINST *B. PARATYPHOSUS* A.

BY MAJOR S. L. CUMMINS AND MAJOR C. C. CUMMING.
Royal Army Medical Corps.

IN the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS for August, 1912, Colonel R. H. Firth,[1] writing on the subject of the prevalence of enteric and paratyphoid fevers in India, makes the following statement:—

"The disturbing factor is the prevalence of paratyphoid fever, against which disease anti-enteric inoculation appears to have little influence. This view is not new, but emphasizes the plea for a bi-valent emulsion with which inoculation must be carried out against both diseases."

Some time ago, at the request of Lieutenant-Colonel Sir William Leishman, we initiated experiments with a bi-valent emulsion of *B. typhosus* and *B. paratyphosus* A, using groups of rabbits on the same lines as those employed by Sir William Leishman and his co-workers in their work on antityphoid vaccine.

These experiments are still going on, and it is not proposed, in this paper, to anticipate in any way the final conclusions of the research. The work which we now publish is only brought forward

[1] "Recent Facts as to Enteric Inoculation and the Incidence of Enteric and Paratyphoid Fevers in India." Colonel R. H. Firth.

because it appears to us to throw an interesting side-light on some of the clinical findings in paratyphoid A fever. It may also be taken to show that the question of prophylaxis against this disease is more complex than might at first sight appear to be the case, and may perhaps emphasize the necessity of a thorough experimental basis before an anti-paratyphoid A vaccine is finally recommended for the use of troops.

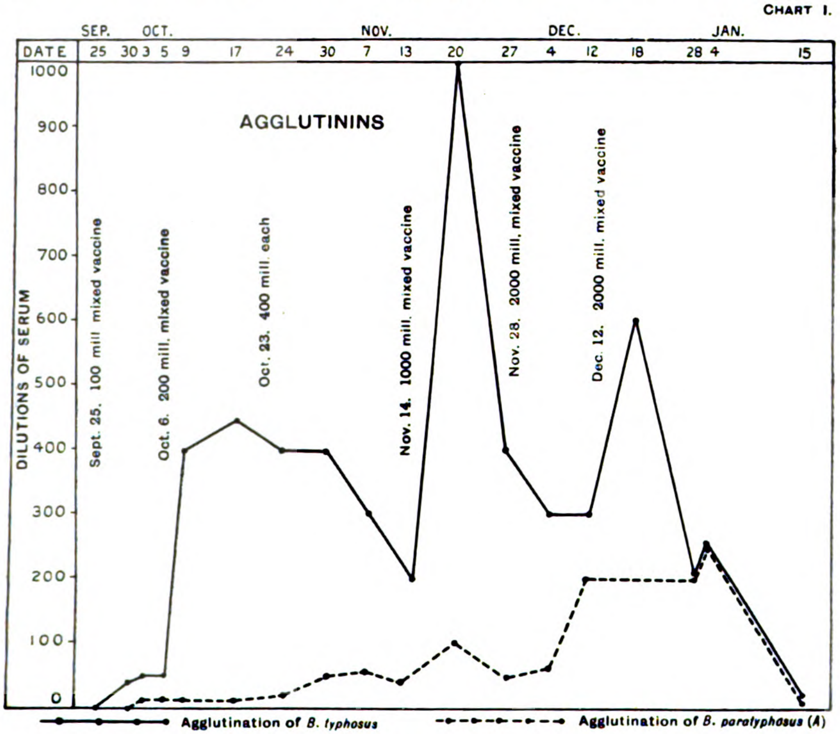
In our first experiment with a bi-valent emulsion we were surprised to find that, although satisfactory production of immune substances for *B. typhosus* followed the injections, the serum of our rabbit-groups showed only very slight response for *B. paratyphosus* A. In the case of the latter organism we failed to obtain agglutination in higher dilution than 1 in 60, and our experiments failed to elicit evidence of opsonins or bactericidins. Although Besson[1] has mentioned the impossibility of producing immunity to *B. paratyphosus* A in rabbits, we had evidence that his statement requires revision, as we had, in the laboratory, a rabbit serum capable of agglutinating this organism in a dilution of 1 in 2,000. This serum, kindly given us by Dr. Leadingham, of the Lister Institute, afforded a proof that rabbits *can* be immunized against *B. paratyphosus* A. It seemed probable that our experiment had failed through the use of insufficient dosage. Our rabbits had received a first dose of 1 c.c. and a second dose of 2 c.c. of a mixed vaccine containing 25 millions of each organism per c.c., or, in other words, a total of 75 millions of each germ, the weight-for-weight equivalent of the 1,500 million typhoid bacilli used in anti-enteric inoculation in man. Dr. Leadingham, to whom we applied for information, was good enough to look up the records of his serum, and told us that the rabbit producing it had received a series of six injections, first with killed, then with living cultures of *B. paratyphosus* A, amounting to a total of 3 c.c. of a saline emulsion of an agar slope. Various "counts" have led us to regard an emulsion of one agar slope of *B. typhosus* in 10 c.c. of saline as containing roughly 2,000 million bacilli per cubic centimetre and the same estimate will not be far out for *B. paratyphosus* A, which grows on agar with much the same facility as *B. typhosus*. It is probable that Dr. Leadingham's rabbit received something like 6,000 million bacilli in all, as compared to our 75 million, which would adequately explain our failure. But doses of equivalent amount for man would probably

[1] "Technique Microbiologique," 4th Edition. A. Besson. Paris, 1908.

cause a very severe reaction and are hardly likely to be used in practice. *The point of real importance was that, given in equal doses,* B. paratyphosus A *appeared to be a much less efficient antigen than* B. typhosus.

In September, 1911, we started a fresh series of experiments designed to ascertain what dose of *B. paratyphosus* A would produce agglutinins to a degree comparable with the agglutinin production following the usual prophylactic dose of *B. typhosus*,

CHART I.



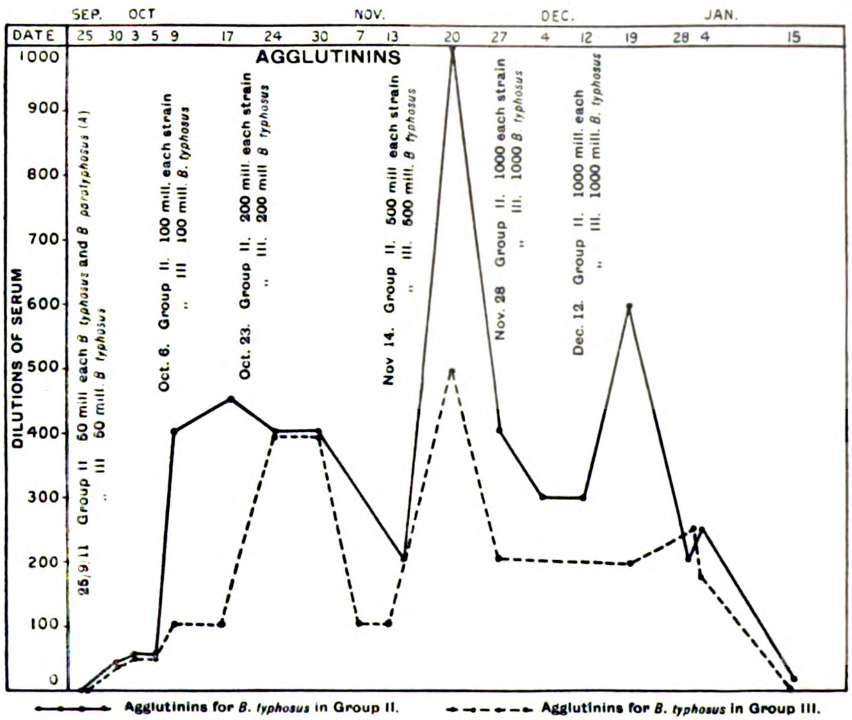
Group II. Inoculated with a mixed vaccine of *B. typhosus* and of *B. paratyphosus (A)*

The chart shows how the Agglutinins for *B. typhosus* exceeded those for *B. paratyphosus (A)*

or, rather, its equivalent for rabbits. For this purpose we used three, and finally four, groups of rabbits, three animals to each group, the weights of the different groups being equalized as far as possible. Group I was kept as a "control" and received no vaccine. Group II received a series of increasing doses of a bi-valent emulsion of *B. typhosus* and *B. paratyphosus* A. Group III was given similar doses of *B. typhosus* alone, while Group IV was treated with two inoculations amounting to 1,500

millions of *B. paratyphosus* A. All the vaccines had been killed by heat (53° C.), and subsequent addition of lysol. It may be mentioned here that the first experiment had contained a fallacy, inasmuch as the paratyphoid A vaccine used had been heated to 60° C. for half an hour, while the typhoid vaccine had been killed as usual at 53° C., so that the two were not strictly comparable. Chart I, however, shows that the agglutinins for paratyphoid A were greatly below those for typhoid in the second experiment as in the first.

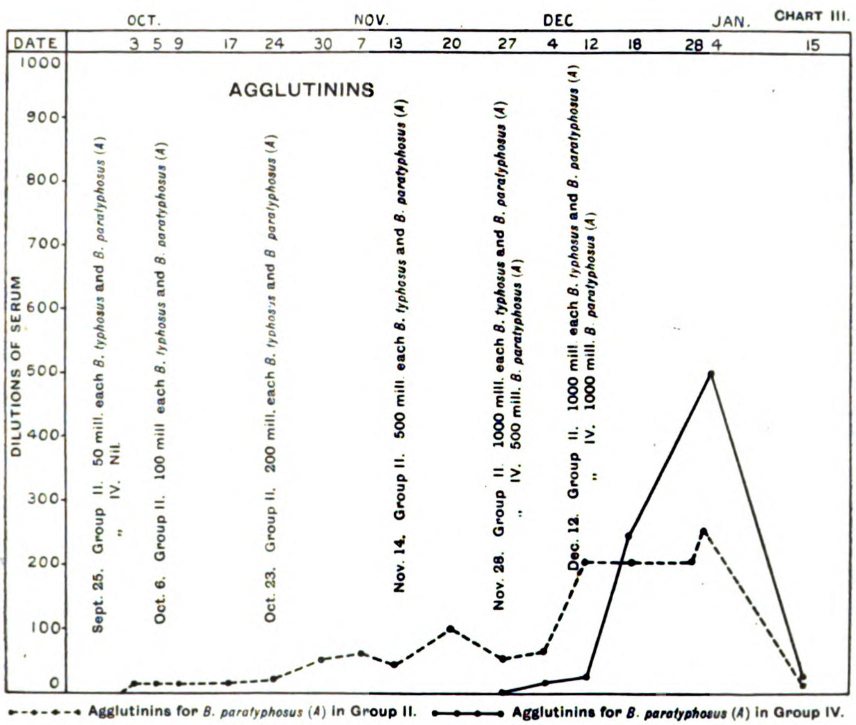
CHART II.



Group II., immunized with a mixed vaccine of *B. typhosus* and *B. paratyphosus* (A), showed higher agglutinins for *B. typhosus* than did Group III., immunized with equal doses of *B. typhosus* alone

A point of great interest emerges in Chart II, where the typhoid agglutinins produced in Group II and Group III are compared. It is here seen that the typhoid agglutinins were consistently higher in the group of rabbits immunized with a mixed vaccine than in the group immunized with *B. typhosus* alone, although the doses of this organism were the same in both. Further, in Chart III, where the paratyphoid A agglutinins in Group II and

Group IV are compared, it is seen that these were decidedly *less* after use of the mixed emulsion than after the two doses of paratyphoid A vaccine alone. This latter fact may perhaps be due to a diminished response on the part of the tissues after a long series of inoculations, as it is seen in Group III that the two last inoculations of 1,000 millions each led to but a very small response, in fact, failed to check the gradual drop of immunity. But, on the other hand, the better production of agglutinins by



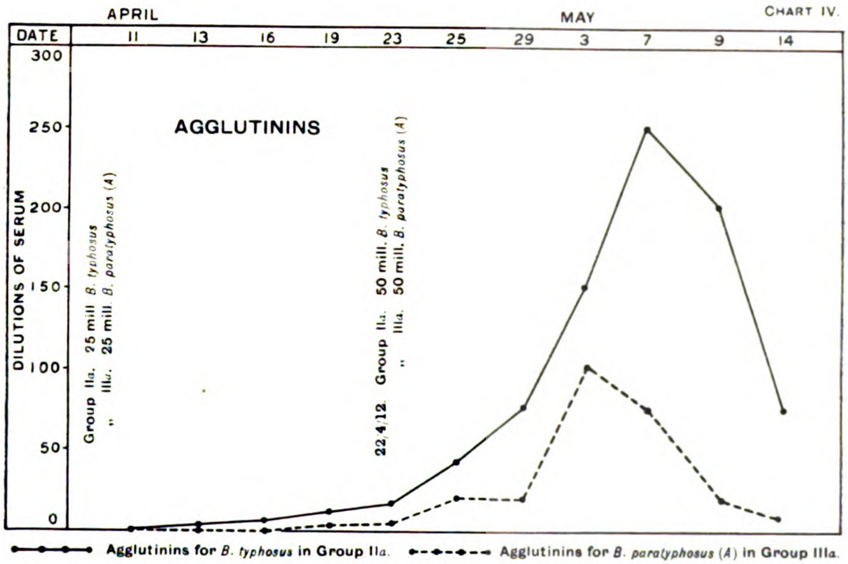
Group IV., which received two doses—one of 500 mill., the other of 1000 mill. *B. paratyphosus* (*A*)—showed higher agglutinins for that organism than Group II. immunized with a series of doses of a mixed vaccine of *B. paratyphosus* (*A*) and *B. typhosus*

an unmixed paratyphoid A vaccine as compared to that by a bi-valent emulsion may be a phenomenon complementary to that exhibited in Chart III for *B. typhosus*.

A third observation was instituted in April, 1912. On this occasion separate groups of rabbits were employed for each organism and the results compared. As before, Group Ia was retained as a control and given no treatment. Group IIa received 25 millions *B. typhosus* on April 11 and 50 millions on April 22.

Group IIIa received similar doses of *B. paratyphosus* A on the same dates. The serum was invariably collected twenty hours after the blood had been withdrawn and was heated to 58° C. for twenty minutes before testing. This heating was carried out to eliminate "complement," as this substance is difficult to estimate by quantitative tests, probably varies in the same serum at different times, and thus introduces a fallacy into examinations of sera for immune substances. Known quantities of guinea-pig serum were employed to "complement" the heated rabbit sera in testing for bactericidins.

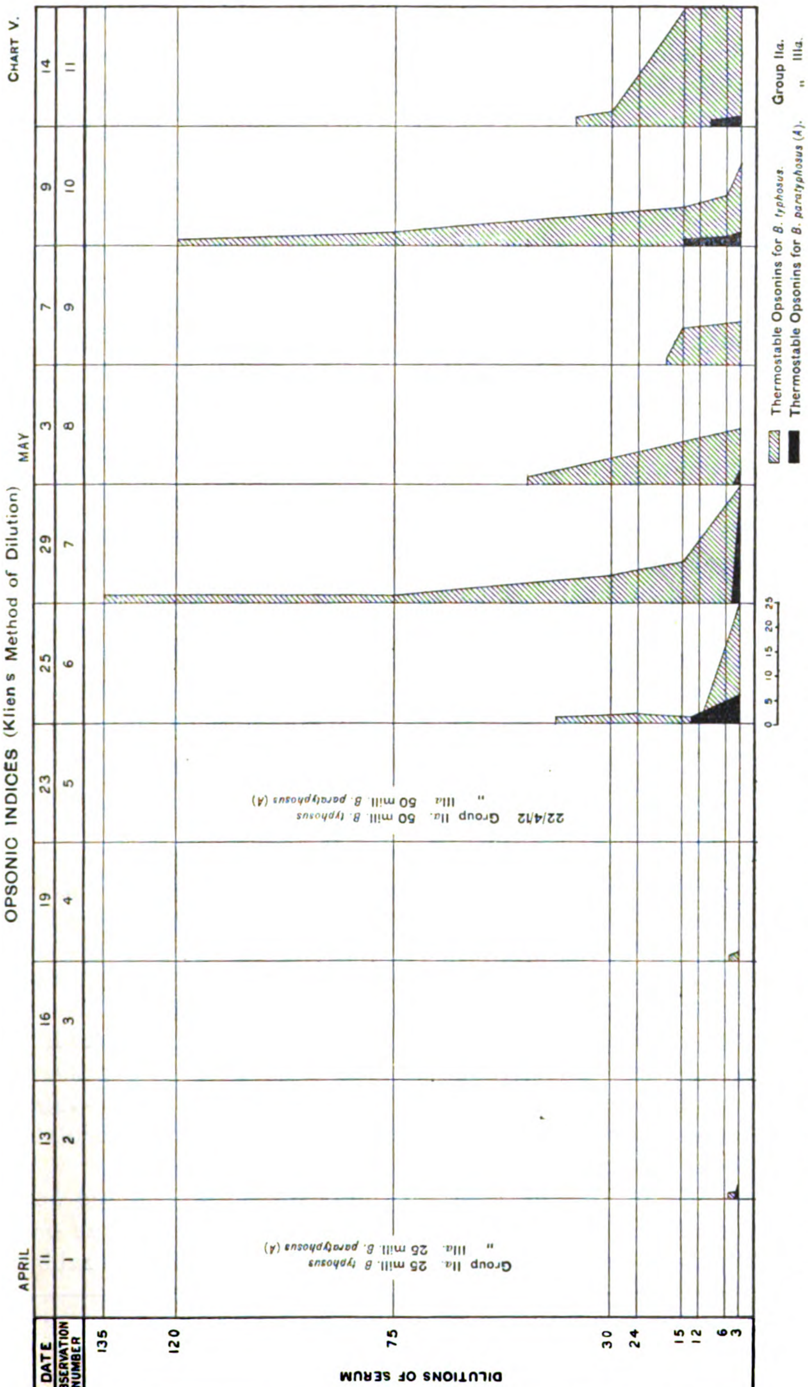
CHART IV.



Group IIa., immunized with two doses of *B. typhosus*, shows higher agglutinins for that organism than does Group IIIa. immunized with equal doses of *B. paratyphosus (A)* for the latter.

The agglutinin production is shown in Chart IV, and again the agglutinins for *B. typhosus* are much more marked than for *B. paratyphosus* A. The thermo-stable opsonins, calculated by Klien's[1] method of dilution to an end-point, are shown graphically in Chart V, where the number of bacilli per phagocyte is shown for each dilution by the horizontal measurement of the shaded area at each level, one degree of the scale corresponding to one bacillus per phagocyte.

[1] "The Opsonins in Typhoid Immunity." By H. Klien, M.D. *Johns Hopkins Hospital Bulletin*, June-July, 1907.



Each degree on the horizontal scale indicates one bacillus per phagocyte. The degree of phagocytosis in each dilution is shown by the horizontal measurement at each level.

The chart shows how much greater the phagocytosis becomes after immunization with *B. typhosus* than after immunization with *B. paratyphosus* (A)

The opsonins for *B. typhosus* are rendered in half-tone, those for *B. paratyphosus* A in black. It is seen at once that while the typhoid opsonins in Group II. are well marked, the opsonins for paratyphoid A in Group III. are hardly significant.

It should be added, in explanation of the chart, that the "end-point" is taken as one bacillus per phagocyte, not 0·5 bacilli as advised by Klein. This was done as, on one occasion, we counted as many as 0·98 bacilli per phagocyte in the heated serum of the control group. Again, finding it difficult to count accurately more than twenty-five bacilli in a phagocyte, we decided to take this as our maximum, and all "uncountable" cells were taken as containing twenty-five bacilli. On April 29 the 1 in 3 dilution of serum brought about a phagocytosis that was actually greater than is shown on the chart in the case of both organisms, and on May 14 this was also the case for *B. typhosus* even in a dilution of 1 in 15. The chart brings to light the curious fact that the end-point may be very high and yet the degree of phagocytosis in low dilutions be comparatively small. This apparent anomaly has been since noticed in other observations of the same kind, and is not merely accidental. It may possibly be explicable on the hypothesis that there are *two* thermo-stable bodies concerned in phagocytosis—an idea which receives support from the highly interesting work of H. R. Dean[1] on the complex nature of agglutination. Attempts to calculate the bactericidal action gave rise to irregular results, and we failed to obtain deviation of "complement" with bacterial emulsions "sensitized" with the heated sera.

It is of interest to compare our results with the findings of Majors Grattan and Harvey, Colonel Firth and others in actual cases of paratyphoid A fever. The very low degree of agglutinin production for the homologous organism and the frequent presence of non-specific agglutinins for *B. typhosus* in the blood of cases of paratyphoid A fever is comparable to our failure to produce high agglutination-*titres* in experimental animals for *B. paratyphosus* A, and the curious over-production of typhoid agglutinins by a bi-valent vaccine as compared with the agglutinins in animals inoculated with typhoid vaccine alone.

It would be interesting to know whether *all* cases showed both paratyphoid A and typhoid agglutinins, or whether the latter only arose in patients previously inoculated against typhoid. In rabbits

[1] "On the Factors concerned in Agglutination." By H. R. Dean, M.A., M.B. &c., *Proceedings of the Royal Society*, B. vol. lxxxiv, 1911.]

immunized with paratyphoid A vaccine only we were unable to demonstrate any agglutination of typhoid bacilli. Another matter of great interest is the fact, mentioned by Colonel Firth, that no less than 14 per cent of cases of paratyphoid A fever become "carriers" for more or less protracted periods, as opposed to 2 per cent in the case of typhoid. It is tempting to connect this with the low *titre* of bacteriotropic substances recorded both in cases and in experimental animals, a condition which would appear to favour the permanence of bacterial foci in the tissues after the septicæmia has been overcome.

THE TREATMENT OF GONORRHŒA AND SOME OF ITS COMPLICATIONS.

By Major L. W. HARRISON and Lieutenant C. H. H. HAROLD.

Royal Army Medical Corps.

A study of the literature on gonorrhœa reveals an astonishing number of methods of treating this disease. Many of them are credited with the power of curing it in anything from a few days to a week or so, and some of these must have been tried by everyone who has treated gonorrhœa. Yet the average duration of stay in Army hospitals for gonorrhœa is thirty-three days; about 15 per cent of admissions for gonorrhœa are for relapses; very large numbers of women are chronic invalids and quite one half of gynæcological operations are performed on account of gonococcal infections generally contracted through marriage with men who believed themselves cured, while a very large amount of blindness from infancy is due to the same cause.

Clearly the cure of gonorrhœa is not so sure and easy as the authors of these numerous remedies would have us believe, and their claims must have been based on tests of cure which were insufficient.

Some time ago we determined to ascertain how far clinical evidence could be relied on as a test of cure in gonorrhœa. Accordingly we examined for the presence of gonococci fifteen patients who had been suffering from gonorrhœa and, under irrigation with weak permanganate of potash solution, had apparently recovered Some days after suspending treatment and administering beer no discharge could be expressed from the urethra by massaging it from the bulb forwards, and the urine was clear and free from threads. The examination was conducted in the following manner, which we have adopted in the case of every patient we have since treated for gonorrhœa before discharging him from hospital.

The urethra was first washed out with physiological salt solution, some of which was finally injected into the bladder. The prostate was then thoroughly massaged for a few minutes and a specimen of any secretion which was expressed from the meatus in this way was examined microscopically for gonococci. At the same time the patient was made to pass into a urine glass the salt solution which had been injected into his bladder. If no gonococci were found in the secretion expressed directly from the meatus the salt solution

was centrifugalized and some of the deposit examined in the same way. The specimens were stained by Gram's method.

We may mention here that on massaging the prostate for the first time a large amount of prostatic secretion often appears and obscures the details in the microscopic specimen, making the detection of gonococci difficult. If, however, the prostate be massaged again on the following day the amount of glairy prostatic secretion is less and the specimen easier to examine.

By this method we found that every one of the fifteen cases were harbouring gonococci, and most of them in large numbers. Subsequently we retained these patients in hospital for a further period and attempted to free them from gonococci, but eventually had to discharge them, clinically cured of gonorrhœa, but really harbouring gonococci and consequently candidates for relapse. None of them showed any gonorrhœal secretion during the period of this later treatment, and, needless to say, all of them, considering themselves cured, thoroughly disagreed with our line of action.

It was quite clear to us after this preliminary examination that clinical evidence, *i.e.*, absence of discharge from the urethra and of threads from the urine, is no criterion of cure. Indeed, we have since found that failure to find gonococci after the test we have described is not a certain indication of their absence, because on several occasions we have failed to find them twice in succession and succeeded at the third attempt on the same case. We think, however, that this test is a more certain means of ascertaining the value of any particular line of treatment than clinical evidence or microscopical examination of secretion obtained only from the anterior urethra, and as it is comparatively easy to carry out we recommend it to anyone who is anxious to test a new method of treating gonorrhœa.

On the next favourable opportunity we commenced an investigation to discover, if possible, a method of treating gonorrhœa which would shorten the stay in hospital, prevent complications, and, by freeing the urethra more completely from gonococci would reduce the number of relapses. Our efforts have not been crowned with very brilliant success, but we have ascertained a few facts which may be useful to those who have to treat this disease.

Previously one of us had obtained evidence that the use of gonococcal vaccine has some effect in preventing the complications of gonorrhœa. Briefly, in two parallel series of cases which were treated identically by the same medical officer except that one received injections of vaccine, the incidence of

epididymitis in these was less than half of that which occurred in the series which received no vaccine.

We had also reason to believe that the use of atropine has some effect in preventing epididymitis. The use of atropine with this object was suggested by Schindler (*Berl. klin. Woch.*, September 3, 1909, p. 1691), who found by experiments on animals that when the posterior urethra was inflamed and was irritated, either directly or through massage of the prostate, a reverse contraction of the involuntary muscle fibres of the vas occurred. He believes that this is the mechanism by which gonococci lying in the posterior urethra are carried to the epididymis, and that it explains how it is that so many cases develop epididymitis a few hours after a metal instrument has been passed along the inflamed urethra. Confirming the findings of Bumm and Leopold, Schindler also found that when the hypogastric plexus was paralysed by administering atropine, either hypodermically or in the form of suppositories, this reverse contraction did not take place. The following case appears to support Schindler's belief. A patient in the Military Hospital, Rochester Row, had suffered from six attacks of epididymitis since admission. Each attack had immediately followed any attempt to massage his prostate and seminal vesicles or to administer local treatment to his urethra. His prostate was considerably enlarged and both seminal vesicles were tightly distended, while all these parts were very tender to palpation. He had also suffered from repeated attacks of arthritis which had spared very few of his joints. It seemed clear that unless the focus of infection in his prostate, &c., were dealt with he would continue to suffer from attacks of arthritis. But massage of the prostate and, in fact, any local treatment was always followed by epididymitis, and for this reason the patient himself dreaded any local interference. In the hope of breaking this vicious circle, an atropine suppository was administered in the evening and another the following morning. An hour after the second suppository the prostate and seminal vesicles were massaged as thoroughly as the patient could tolerate. No attack of epididymitis followed this time, and the massage was continued, at first on alternate days and then daily, while the urethra was treated with daily injections of protargol. The prostate and seminal vesicles gradually improved and shrunk to their normal size, no further attacks of arthritis occurred, and the patient was eventually returned to duty, at which he has continued for more than a year.

Impressed by this case we have since administered atropine

suppositories ($\frac{1}{75}$ gr. in each) twice daily to each of our gonorrhœa cases and attribute to this some reduction in the incidence of epididymitis, as well as the marked freedom of our patients from painful erections and chordee.

As is well known, opinions on the treatment of gonorrhœa are broadly divided into two schools: (1) Those who consider it essential to treat the urethra locally, while observing the rules for general treatment, and (2) those who consider that local treatment is of no value, or even harmful, and rely entirely on general treatment with internal medication.

With regard to local treatment, our experience had led us to believe that better results could be expected in the acute stage from irrigation of the urethra with fairly large quantities of some bland liquid like weak permanganate of potash solution or physiological salt solution than by applying to it stronger bactericidal preparations such as protargol or silver nitrate. In fact, we had found that when protargol ($\frac{1}{4}$ or $\frac{1}{2}$ per cent) was used in the acute stage the urethra was kept in an irritable condition for a longer time, while the discharge continued to a later date and epididymitis seemed to occur more frequently.

We concluded from this that if local treatment were of any value in the acute stage it must act mechanically by removing gonococci and their toxins, as well as diluting the latter.

Regarding internal medication, we had not witnessed such brilliant results from the use of sandal-wood and copaiba preparations as to convince us that we could expect any marked benefit from their use. In fact, the only specific internal remedy which we believed might affect gonorrhœa more favourably was gonococcal vaccine.

In order to determine in a general way the comparative values of (*a*) purely local treatment, (*b*) purely general treatment, with the help of gonococcal vaccine, and (*c*) local and general treatment with the help of vaccine, we divided our freshly admitted cases of uncomplicated gonorrhœa into three series. The first was treated with large irrigations of physiological salt solution three times a day, using half a gallon of solution for each irrigation. In the second no local treatment was administered, but a small dose of gonococcal vaccine was injected twice a week, while the third series had irrigations like the first and vaccine like the second. All the patients were ordered rest and diet as is customary with gonorrhœa, and each had an atropine suppository twice daily.

In the course of a few weeks we found that the progress of

the third series (local treatment plus vaccine) was the best. The disease pursued a milder course, and the discharge ceased in a shorter time than in either of the other two, while quite a large proportion showed no gonococci when the test was applied after the discharge had ceased for a few days. Those who were treated with vaccine only were making very slow progress when, in fairness to them, the experiment was concluded and local treatment commenced. In those who received irrigations only the disease pursued much the same course as under irrigations with permanganate solution, but, if anything, they were rather longer in clearing up. It was easy to find gonococci in both these series some days after the discharge had ceased.

Concluding from this preliminary investigation that the best results were to be expected from vaccine combined with local treatment, we then tried to improve the local treatment.

Interpreting the relations between gonococci and the urethral tissues in the light of pathology and symptoms it appears as if invaders and invaded waged a fierce battle at first, but that the tissues eventually came to tolerate the micro-organisms under mild protest; a protest which is insufficient to remove them just when a little further effort might succeed. For this reason we judged it well after the inflammation had considerably subsided to try the effect of a mildly stimulating and bactericidal application to the urethra, and modified the local treatment thus.

After irrigating with physiological salt solution throughout the acute stage till the discharge had become considerably less, the urethra was treated with the following solution:—

℞	Cupri. sulph	¼ gr.
	Zinc. sulph	½ ,,
	Aq. .. .. ad	℥i

a few ounces being injected thrice daily after the usual irrigation. The change effected a great improvement. In some cases the discharge ceased in a week or ten days after admission to hospital, and in the majority in about seventeen days. The urethral secretion was purulent till it disappeared, and a few days later the urine was clear and free from threads. In this respect there was not a very marked improvement on treatment with irrigations of permanganate of potash solution, but examination of any secretion which could be expressed by massaging the prostate and anterior urethra showed that in a large proportion of cases treated in the way we have described gonococci could not be found, and these

were certainly never so numerous as in any of the patients treated by the other methods we have mentioned.

Lately we have substituted weak permanganate of potash solution for the saline as an irrigating fluid and find that the discharge becomes less in a rather shorter time, so that the astringent solution can be added to the treatment at an earlier date. Possibly, as Major Pollock has suggested, the permanganate solution neutralizes the gonotoxin to some extent so that this effect is added to that of removing mechanically the micro-organisms and their toxins.

We have also tried the effect of substituting protargol solution (¼ per cent) for the zinc and copper, but have not found that our cases progressed better under its use. Schindler has lately recommended that in cases which do not clear up quickly, and the disease appears to be passing into the chronic stage, a protargol jelly should be administered. The prescription is as follows:—

℞ Agar jelly (2·5 per cent)	40
Dissolve with gentle heat and add distilled water ..	160
When cold rub up with protargol	1

We have tried this jelly on a number of cases and find that it is useful if not commenced too early. The agar basis has the effect of maintaining the protargol in contact with the urethral wall for a longer time than is possible with a watery solution. If commenced too early, however, before the acute stage has well subsided, it seems to keep the urethra in an irritable condition and delays recovery. Possibly we have made our patients retain it in the urethra too long, and it would be better to expel it by urination or other means after ten minutes or a quarter of an hour. In the majority of cases we have found that the injection of protargol jelly has produced a thick discharge which was apparent the following morning, the secretion containing numerous polynuclear cells, but few or no gonococci. In some cases after a thick discharge had followed the protargol jelly in this way for a few days it ceased, and on applying the test no gonococci could be found. As far as we can judge at present, therefore, we think that protargol jelly will prove a useful adjunct to other local treatment, but should not be commenced too early, nor should the jelly be allowed to remain in the urethra too long.

To complete the account of our investigation into the local treatment of gonorrhœa we may mention that we have tried ionic medication of the urethra in a few cases in which gonococci

persisted after other symptoms had cleared up. The treatment was applied in the following way. After injecting some sulphate of zinc solution ($\frac{1}{4}$ per cent) into the bladder a specially made gum elastic catheter provided with a number of small perforations in its sides and containing a pure zinc stylet round which the mouth of the catheter was fastened to prevent any solution escaping, was passed. The zinc electrode was connected to the positive pole of a constant current battery, the negative pole being connected with an electrode applied to some other part of the patient's body. A current of 5 milliamperes was passed for five minutes. The effect in each case was to cause a purulent urethral discharge, which ceased in a few days, and examination then showed a reduction in the number of gonococci, while in some they could not be found. We have not tried this method of treatment sufficiently, however, to report definitely on its merits, but would not use it in the acute stages of gonorrhœa.

To summarize the results of our investigation into the local treatment of gonorrhœa we have obtained the quickest apparent recoveries from the following procedure :

(1) Irrigation of the urethra three times a day with large quantities of weak permanganate of potash solution (1 in 3,000 to 1 in 4,000) till the discharge has considerably diminished. Then

(2) Injection of zinc and copper solution after each irrigation till the discharge has practically ceased and, finally,

(3) Injections of protargol jelly in place of the zinc and copper after massaging the prostate and irrigating the urethra.

(4) Atropine suppositories ($\frac{1}{75}$ gr. in each) twice daily.

Confirming the observations of others, we think it important for the prevention of epididymitis that the following precautions should be observed :—

(*a*) The irrigator should not be more than five feet above the urethra; (*b*) the temperature of the irrigating or injection fluid should not be greatly above or below that of the body; (*c*) strongly irritating fluids should not be injected; and (*d*) the patient should rest in bed for the first week and duty should be light till the discharge has ceased for a few weeks. Pack-drill immediately on leaving hospital seems to be a very potent factor in producing epididymitis. It is worth while taking considerable pains to prevent epididymitis, since these cases are by far the most intractable gonococcus carriers and the most prone to relapse, so that they spend a considerably longer time in hospital than uncomplicated cases of gonorrhœa.

Regarding the vaccine therapy of gonococcal infections, opinions are divided. Probably most workers agree that it is generally useful in the complications of gonorrhœa, but few consider it of any value in gonorrhœal urethritis. Our experience leads us to believe that gonococcal vaccine may usefully be employed not only in the treatment of complications but in ordinary cases of gonorrhœa. Considering the beneficial effect of vaccine on complications of gonorrhœa it is reasonable to suppose that when the gonococcus passes into the blood-stream and invades other parts of the body, generally speaking, it is not in such a favourable medium as on the urethral mucous membrane. If, therefore, the anti-gonococcal substances in the blood can be increased gonococci will be destroyed as soon as they come under their influence, and complications will be nipped in the bud. Further, in a patient whose resistance to the gonococcus had been raised the micro-organism could not penetrate so deeply below the surface of the urethral mucous membrane as in other cases, since in doing so it would come within the sphere of influence of the blood. In other words, the inflammation should be a more superficial one.

We have mentioned that in a series of cases in which we administered gonococcal vaccine with the object of preventing complications the incidence of these was less than half the number which occurred in a similar series treated without vaccine. Incidentally it was also noted that the cases treated with vaccine did not suffer from periurethral thickening to the same extent as the others.

We think that it is useful to continue vaccine treatment after the patient has left hospital, with a view to preventing relapses. Even failure to find gonococci after three tests such as we described in the beginning of this paper is not a certain indication of complete absence. For this reason we have considered that quite possibly all the cases of gonorrhœa we have discharged from hospital were gonococcus carriers, and have made as many as possible of them attend as out-patients for a few weeks afterwards. Out of 115 patients discharged from hospital 91 attended for vaccine and 2 relapsed, both being men who had suffered from epididymitis, and one of these a patient who was specially discharged for private reasons before the inflammation had properly subsided; out of 24 who could not attend 6 relapsed, three being old epididymitis cases. It seems, therefore, as if continued treatment with gonococcal vaccine had been beneficial in preventing relapses.

The vaccine we have used was prepared at Rochester Row from

cultures isolated from eight or ten different sources. It was killed by the addition of 0·5 per cent carbolic acid. As regards dosage, we have been guided by clinical symptoms. With one batch of vaccine we were able to inject 25 millions without producing any marked increase of the discharge or general disturbance, but with later batches we have found it advisable to commence in acute cases of gonorrhœa or of arthritis with a dose of 2·5 millions, increasing this to 5 millions three or four days later if no marked disturbance followed. We do not exceed 5 millions twice weekly till the gonorrhœal discharge has ceased. After this it is increased to 12·5 to 25 millions, and in more chronic cases may usefully be increased to 50 or 100 millions. When the larger doses are given the vaccine is administered once a week.

Irons and others have suggested that gonococcal vaccine may have some diagnostic value, acting in a manner analogous to tuberculin by producing a local and general reaction in the presence of a gonococcal infection. This is supported by the increase of gonorrhœal discharge which numerous observers have found after administering the specific vaccine. We have frequently noticed this increase of discharge and have reason to believe that gonococcal vaccine produces a local and general reaction in the presence of other gonococcal lesions. Patients suffering from complications frequently have some slight temporary increase of pain a few hours after the injection of vaccine, and in a few cases where it was doubtful whether a certain train of symptoms depended on the gonococcus or not, the injection of a dose of vaccine enabled us to settle the point. In illustration of this, a patient who was suffering from rheumatism of the feet had not had a gonorrhœal discharge for eighteen months. Examination by the test we have described failed to reveal any gonococci in his urethra on three occasions. A dose of gonococcal vaccine (25 millions) was injected and was followed by a marked increase of pain in the feet and reddening round the joints, as well as a slight urethral discharge in which gonococci were found. Another patient who had suffered intermittently from gleet for some years had been examined by a number of experts who could not give a definite opinion as to its gonococcal nature. Our first examination was negative, but on the day after injecting a dose of gonococcal vaccine the diagnosis was established by finding gonococci in the urethral discharge which appeared.

We can confirm the observations of those who have found vaccine of value in gonococcal metastases. We have obtained excellent results from its use in cases of arthritis, sclerotitis, epididy-

mitis, periostitis, and teno-synovitis. In some cases, however, it has proved disappointing, and these have been patients who were suffering from very acute arthritis attacking several joints in succession and accompanied by severe general symptoms. Possibly our dosage was faulty in these cases, erring on the side of over-dose, and we have certainly found that these very acute cases ran a more favourable course under injections of 2·5 millions of gonococcal vaccine or less twice weekly than under larger doses.

In the treatment of the more severe grades of gonococcal arthritis we have been impressed by the benefit which resulted from keeping the joints at absolute rest. In two cases, one of arthritis of the hip joint, the other with considerable effusion into the knee, no improvement occurred till mild extension was applied to the joint. After this progress towards recovery was very rapid. In addition to loss of sleep lowering the patient's resistance, it is very probable that lack of complete rest to the joint results in heavy overdosing with gonotoxin by auto-inoculation.

Ionic medication (using chlorine ions) has proved very useful in removing the adhesions of partly anchylosed joints, and its effect on joints which were distended with fluid has been very striking. Frequently we have seen a knee-joint which was tightly distended with fluid reduced almost to normal dimensions the day after applying ionic medication to it. It is necessary, however, to persevere with the treatment regularly for some weeks to obtain a cure. Otherwise the joint soon relapses to its former condition. We found little or no benefit from ionic treatment of a flat-foot due to gonococcal infection, but this is hardly surprising considering the anatomical deformity which had occurred.

In conclusion, we would say that there is at present no royal road to success in the treatment of gonorrhœa, but that by attention to detail much can be done to shorten the stay in hospital and to prevent complications and relapses. All of these are matters of importance considering the very large numbers of patients who are admitted yearly to Army hospitals for gonococcal infections.

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THE PHILOSOPHY OF OUR ARYAN BROTHER.[1]

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Some time ago, I submitted an article on our Aryan brother in which an effort was made to give an historical outline of the main upheavals in the philosophic and religious evolution of that race.[2] Limitation of space permitted of no attempt to enter into any details or analysis of the religious philosophy which underlies and influences the religion and lives of our Aryan brother. To fill those gaps is the object of this article.

Without necessarily being a believer in or a follower of Aryan religious philosophy, before one can write or even read intelligently upon the subject, it is essential to be in sympathy with the Aryan mind and thereby catch the *spirit* of its thought. Perhaps the greatest difficulty in acquiring this sympathy is the fundamental opposition between our and their philosophical conceptions. To us, the creation of the world is a basic proposition, to the Aryan it is unthinkable in that it implies the doctrine that something was made from nothing. To the Aryan everything that *is* is either an eternal thing or else a form or manifestation or phase of some eternal thing. From this point of view a mortal thing can never become immortal ; to be immortal a thing must always have been immortal, therefore everything that is born must die and everything that dies must have been born some time. This explains why the Aryan is unable to accept the view of soul immortality unless previous immortality be conceded to it. To him it is ludicrous to conceive any Power making a soul from nothing and then bestowing immortality upon it. These are the basic conceptions deeply ingrained in the minds of all Aryans, and the various so-called Hindu philosophies and religions are merely offshoots from this common root.

On those who took the trouble to read my first article, the impression was perhaps made that the question of Aryan religions was one of great complexity and confusion, seemingly based on a shifting foundation and lacking coherence. To those of us out in India the same impression is given, more particularly as we see

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men leading austere and ascetic lives, and know of high spiritual teaching based on a refined and subtle philosophy coming from the advanced thinkers; while on the other hand all around among the masses one sees and hears of the grossest superstition and credulity accompanied by the most absurd forms of ritualistic nonsense, and not infrequently evidence of the worst forms of the old Phallic worship with its associated immorality and obscenity. These are incongruities difficult to reconcile, but, in the history of all races, there are these extremes and contradictions. Usually these antitheses are separated by periods of time or eras of thought; in India, the difficulty is that they exist contemporaneously and side by side. As a student of this question one can only explain the lowest forms of superstition and religious debasement in India alongside of the highest types of religious and philosophic knowledge and teaching by the mentality of the Aryan and his history. For ages the Aryan race has been separated by but a thin veil from "the other side of life." For ages the Aryan mind has been trained to regard the material world as an illusion, and that to the spiritual world the mind of man may most effectually be turned. In a mental soil so rich with material for spiritual growth we find a ready field for noxious crops of superstition, devil-worship and other debasements of thought and practice. This being so we see the more cultured minds mounting to a higher plane and finding satisfaction in an esoteric philosophy, while the ignorant and mentally ill-developed resort to and are satisfied with the lower psychic and spiritual ideals, as represented by the grosser polytheism of our day. Having thus cleared the way, we may pass to an examination of the theory underlying the whole of Aryan thought, and then see how from this theory a philosophy has been evolved, and how the teaching of this is interpreted in the main cults current among our Aryan brothers.

I.

The three following axioms are the basis upon which is built the whole of Aryan philosophy:—

(1) From nothing, nothing can come; something cannot be caused by or proceed from nothing; nothing real can be created, for if it is not now, it never can be; if it ever was not, it is not now; and if it is now, it ever has been.

(2) Something real cannot be dissolved into nothing; if it is now, it always will be; nothing that is can ever be destroyed;

dissolution is merely the changing of form, or the resolving of an effect into its preceding cause, real or relative.

(3) What has evolved must have been involved; the real or relative cause must contain the effect; the effect must be the reproduction of the real or relative cause.

Starting from these axioms, the teaching which underlies all the Aryan philosophic systems develops from the basic idea that there is one Absolute Being from which all else emanated, and from whom all individual souls proceeded. It followed from this that the soul is immortal, but capable of re-birth under a universal law of cause and effect. Even in the earliest developments from this idea, it was formulated that there is nothing constant, fixed, or imperishable in the observable aspects of the universe; consequently, none of the things of this world are real. Next, underneath all the changing manifestations of the universe there must be something that is Real. This Reality must be One in its essential being, otherwise there would be no continuity or method in the observable universe. Obviously, this ultimate Reality must be above all observable attributes or qualities, including man; hence its inner nature is unknowable, and beyond definition or name. The Sanskrit term for this unknowable Reality is *Tat*, but in current Aryan literature it is usually referred to as the *Brahman* or Absolute. As something could not come from nothing, or something be dissolved into nothing, it is reasoned that the *Brahman* was eternal. The next step in reasoning argues that as nothing existed outside the *Brahman*, therefore the observable universe is the effect of the Brahman, and the *Brahman* is the Cause. We must here note that the Aryans never say "the first Cause"; to them the Cause is the only real cause, and withal a causeless Cause. The subtlety of this is obvious. A further step is the affirmation that as all that *is* must be real, and as the *Brahman* is all that is real, therefore the *Brahman* is all that *is*, and consequently anything that is not the *Brahman* can be nothing that *is*. It follows from this that all that seems or appears to be must lack reality and existence, and must be either nothing or else an emanation or manifestation of the *Brahman* or Absolute. It comes, therefore, to this that to the Aryan philosopher, the *Brahman* or Absolute is that from which all life, function, and attribute is manifested by emanation, reflection, or otherwise; and it is only when all these secondary conceptions of the *Brahman* are thought away that the Absolute is thinkable.

II.

On these fundamental ideas six main and some ten or more minor systems of philosophy have been evolved by the advanced thinkers among Aryans. Only one calls for detailed analysis, as it is the system controlling and behind the religion of nine-tenths of present-day Hindus. The system in question is the Vedanta; the other great and minor systems are practically dead in India at the present time, each having relatively few adherents. All are dominated by the ideas already explained, but differ one from another in respect of details and metaphysical arguments.

The Vedanta Philosophy had as its forebear the original system of Kapila dating back to about 1500 B.C. The Vedanta system probably dates from 700 B.C., when it was evolved from the Upanishads or later Vedas in response to the demands of the philosophical minds of the Aryans, who desired a codification of the general speculative ideas of the race dealing with the Absolute and its relations to the many, as distinguished from the ritual and dogmas upon which the early parts of the Vedas laid so much stress. The dominancy of this particular system dates from the middle of the eighth century or the time of the decline of Buddhism in India. The cold doctrine of Gautama, the Buddha with its austerities, did not satisfy the cravings of the race for a more tangible religion—though it had driven many of the old ideas and dogmas from the minds of the people. In response to this need, a revival of the Vedanta philosophy, led by Sankara, has been followed by an extension of its adherents throughout India, until now it practically holds the field amongst orthodox Hindus.

A basic proposition of the earlier Kapila system is that in the universe there exist two emanations from the *Brahman*, the interaction of which produces the activities and forms of the universe, including Life. These two principles or emanations are *prakriti*, or the primordial substance or energy from which all material forms and energies evolve, and *purusha*, or a spirit which seeks embodiment in *prakriti*, thus giving rise to all the various entities from atoms to man. The entanglement of *purusha* in *prakriti* leads to *Ishwara*, from which results the whole of the observable world. This dual aspect of the *Brahman* involving a conception of many forms of matter sensitized by many souls or spirits is not accepted in this simple form by the Vedantists, as a whole. One school holds that the *Brahman* contains within himself elements of plural modes of existence which share his

reality, and are at one with himself, although apparently separate and individual. This school further holds that the material universe is an illusion occasioned by the individual souls or plural elements of the *Brahman*, being deluded by Ignorance, which produces *maya* or Illusion, the cause of the material universe as man sees it. When the individual soul realizes its nature and identity with the *Brahman*, the spell of *maya* or illusion is over, and the soul escapes *samsara*, or this present world of existence or cycles of existences, and returns to its original state of Bliss by absorption into the *Brahman*.

The other school of Vedantist thought, and which claims to be the exponent of the true philosophy of Sankara, maintains that the *Brahman* himself is entangled and affected by the baleful principle of *maya* or illusion, and that the *Brahman*, influenced by this glamour, imagines himself separated into countless individual spirits or souls and creates an imaginary universe of the senses which serves to bind it more and more. From this, it will be obvious that the Vedantist of this school conceives the *Brahman* or Absolute One involved in a figment of his own imagination, losing himself in a dream of an observable universe and believing himself to be countless individual selves or entities, instead of the One spirit and One self which he really is. We must own that it is an extraordinary conception and represents the extreme position of the Vedantic idealistic philosophy. Putting it in another way, the teaching of this school of Vedantists amounts to this, that the *Brahman* being the one immutable, indivisible Reality, it follows that the observable manifestations or phenomena of this present world of existence and the material universe are but illusory fictions—the figments of the imagination or dream state of the *Brahman* himself. The first stage of the fantasy being the illusion of "separateness," the second stage being the illusion of the sense universe appearing to the individual entities or souls, which themselves are but illusory fictions in the mind of the *Brahman*. To use one of their own phrases, it is the *Brahman* who sees himself reflected from the water drops or water jars of *maya*, and imagines that he is many instead of one. So long as they are in the bonds of this world which holds their attention, the individual souls or entities persist in their illusory semblance or reflection of the *Brahman*, though all the time they are but the *Brahman* himself. Only by realizing this unity with the Absolute can each soul or entity escape, one by one, from this glamour of Illusion or *maya*, and awaken from the dream of

samsara or this present cycle of existences. Only by "knowledge" can the soul escape its isolated bondage and return to a true consciousness of its Real Self.

If the reader has followed the argument it will be apparent that the differences between the two schools of Vedantists is really a matter of metaphysical conceptions. Both accept the doctrine of illusion, but differ as to the manner by which it comes about. This idea of the illusory nature of this world and all its manifestations runs through all the Aryan philosophies and is the key to the peculiar mental attitude of Aryans which is so puzzling to us when we discuss the nature of Life and its destiny. One of the most difficult questions which arises in discussions of this kind between ourselves and an educated Hindu is, what is the nature and origin of this mysterious *maya* or function of illusion? What is the cause of *maya?* It must come from the *Brahman*, then why does he permit it? Most Brahmans decline to discuss it in this form. They say that *maya* appears and is in accord with the *Brahman's* nature and being and that it is no question of its being contrary to the will or desire of the Absolute One. From this point of view, therefore, the *Brahman* himself is the cause and why of *maya*, or, in other words the mystery is unsolvable except by the *Brahman*, and the question can no more be answered than the reason or necessity of the existence of the *Brahman* himself. We find then that even the Vedantist philosophy brings us no nearer the solution of the great riddle of all, which is why was the universe created? Notwithstanding the advanced metaphysical views of the Vedantist philosophers the doctrine of a personal God is admitted. *Ishwara* is the personal God, by the conception that when the creative processes began, the *Brahman*, overspread or under the glamour of *maya*, manifests first as *Ishwara* and then from *Ishwara* proceeds the remainder of creation. The deduction follows that the individual soul is identical with *Ishwara* and *Ishwara* is identical with the *Brahman*. Thus, *Ishwara* is the universal soul, containing within itself the collective totality of all individual souls, and may be worshipped as a personal God and loved as an Over-soul. But even *Ishwara* is but an appearance in *maya* or illusion, and finally must awaken to the fact that he is nothing in himself but everything in the Absolute. In the same way, the individual soul, once seeing the truth or acquiring the knowledge, may ignore *Ishwara* and breaking free from his illusory nature may proceed direct to the *Brahman*. The attainment of this knowledge is possible only by self-

contemplation, right living and good works, the rewards and advancement up the steep ladder of knowledge being strictly in accord with *karma* or the effects resulting from action by means of a series of re-births.

III.

The reader with a knowledge of India may say these metaphysical conceptions are all very well, but what bearing have they upon the every day religion of our Aryan brother as one sees it in that country? We pass now to consider that point, but would preface it with the statement that India's philosophies and religions blend and coalesce; there is no hard and fast dividing line between them, they are really two phases of thought. In the earlier centuries of their history, the Aryans were pantheists. As time went on the nature and duties of the Gods changed or the conceptions of two or more Gods were blended into one. As this process developed, the distinctions between the several Gods became vaguer, and the people began to regard them as appearances or personifications of some one deity. The philosophers and priests of these early days undoubtedly had developed an idea of a Supreme Self, an Absolute or the *Brahman*. Gradually the idea made headway among the masses, and accordingly the God *Brahma* or personification of the *Brahman* began to attain popularity. Though *Brahma* thus began to be regarded as the creative deity ,he did not altogether displace the older Gods, some of whom were retained as subordinate to *Brahma*. Under the tutelage of the priestly castes, there slowly developed a definite idea of the *Trimurti* or Hindu Trinity, represented by *Brahma*, *Vishnu* and *Shiva*, these being held to be aspects of the One Supreme Being, or respectively the principles of Creating, Preserving and Destroying.

From the fact that *Brahma*, as the creative principle in the Trinity, was too much of an abstraction to be the object of worship, the popular idea centred on the two other aspects of the *Brahman*, with the result that *Vishnu* and *Shiva* came to be regarded as the highest conception of the fundamental *Brahman* or Absolute One. At the same time, the worship of the *Brahman* as conceived in the philosophies has almost disappeared as a distinct form of religion. It is true that, nominally, the Hindu Trinity is spoken of as existing and ruling the religious conception of India, but in reality it is not so; and the two great classes of present day Aryans, who represent the modern Hindu religion, have practically discarded the

Trinity and substituted the worship of *Vishnu* or *Shiva* as the case may be. *Brahma* is still seen in the temples, usually as an image with a red body and several heads. His chief worshippers are women desirous of children. We may now pass to a consideration of the development of the two present-day cults from their earlier form to the present, particularly as concerning the influence of the underlying philosophy.

The two dominant cults among present-day Aryans are the *Vishnuites* and the *Shivaites*. Although besides these there are a number of minor cults, still all belong more or less to the two great schools.

The *Vishnuites* are those who worship the Supreme Being under the name of Vishnu, the second person of the Aryan Trinity and presenting the aspect of Preservation of the Absolute One or *Brahman*. The original rise of this cult dates from the eighth century, but since those days it has undergone many vicissitudes, the most notable being one in the fifteenth century when stress was laid on the worship of *Krishna*, an avatar or incarnation of Vishnu, who was represented as a most attractive human personality. The Krishna variation of the Vishnu cult developed certain ecstatic and emotional phases known as *bhakti* or love worship; for a while it made much headway, but in this form during the last two centuries it has gradually lost ground and the cult reverted to a less exaggerated type of emotional Vishnu worship.

The *Vishnuites*, who usually mark their foreheads with vertical lines as a cult sign, hold that Vishnu may be considered in both the impersonal and personal aspects. As the impersonal Vishnu, he is the *Brahman* or Absolute One of the Vedantist philosophy. Practically, no one worships Vishnu in this impersonal sense. When we come to everyday worship the personal aspect is ever in evidence. The personal Vishnu is held to dwell in the highest heavens which he rules. In the temples, he is usually represented by a blue or black image. The popularity of the Vishnu cult is probably due to the fact that he is believed to have had various avatars or incarnations in human form. These avatars are supposed to have appeared for the purpose of regenerating the race at times when it was in need of revival. The two chief incarnations of Vishnu which receive worship are—as Rama or as Krishna. Rama is held to be the seventh avatar of Vishnu, and is the hero of the great epic the Ramayana. We need not follow the history of Rama as given in this poem, other than to say that he figures therein as the saviour of mankind. The devotees of Rama are very

many and generally noted for their high moral tone. They hold that Vishnu has positive qualities of goodness, and that there is a heaven of pure bliss in which the righteous emancipated soul will spend eternity, instead of being absorbed into the *Brahman* as formulated in the Vedanta philosophy. Krishna is the eighth avatar of Vishnu, and his history and teachings are given in the epics known as the Mahabharata and Bhagavad-Gita. The devotees of Krishna are notable for their extreme "Love of God" conception, possibly as a phase of the *bhakti* ideas of an earlier period. Many exalt *Rahdi*, the consort of Krishna, to a high position in association with a child, and in this form there is a superficial resemblance in some of their ceremonies to those associated with the Roman Church. The Krishna cult has been subject to many subdivisions. Some sects are notable for a high degree of morality and a pure form of worship, but others have lapsed into low forms of ceremonial, degenerating in some cases to a type little removed from the old Phallic worship. In the temples, Krishna is usually represented by an image playing a flute and often with his consort encircling him with her arms.

The *Shivaites* usually carry a cult sign in the form of horizontal lines on the forehead. Their deity is Shiva, the third person of the Aryan Trinity. He typifies those aspects of the *Brahman* which may be described as pertaining to change, reproduction and destruction. While the Vishnuites, by virtue of their God Vishnu existing as human avatars, can regard and do regard him as being in intimate relation with them as human beings, the Shivaities have no such sense of intimate approach to their God, the reason being that Shiva is not held to have had any human incarnations or avatars.

The Aryan conception of Shiva is twofold. One or other is favoured by the various sects in the general cult. In fact, there are two Shivas or two aspects of him as conceived by his devotees. The higher Shiva sects, such as the *Dandis, Dasnamis* and *Lingayats*, are ascetic and puritanical; these virtually worship the *Brahman* under the name and form of Shiva, and their religious philosophy resembles that of many Vishnuites. Other high sects are composed of the better class of *Yogis.* To these latter, Shiva represents renunciation and unworldliness, and is the God of magic and superhuman powers, in fact, a personification of the Supreme Being with whom they are ever seeking union. Behind all this, among these higher sects, is the Shiva of the transcendental philosopher who thinks of him as identical with the *Brahman* or

Absolute One. In contrast to these are many low and degraded sects. To them Shiva is a fierce, revengeful, warlike God of a destructive tendency. This aspect attracts to him the ill-educated and uncultured, or those whose minds turn to self-torture and low forms of asceticism so much affected by certain false *yogis* or mendicants. Among sects worshipping this aspect of Shiva, his images are revolting and weird, in fact, among these devotees, Shiva is little more than a sorcerer God, and their worship little more than a devil worship, devoid of any of the higher philosophical conceptions.

Associated with Shiva worship is *Shakta* worship or veneration of the creative principle. In its higher forms *shakti* worship is the adoration of the mother aspect of Nature, and is analogous to some Western ideas expressed by poets who rhapsodize over Nature personified as a Mother Being. In contrast to this, there are many low sects of Shaktas who picture and venerate *shakti* in hideous forms representing death, disease and other undesirable aspects of Nature and Nature's laws. Many of the devotees of Kali, Durga and other wives of Shiva have similarly associated their cult with conceptions representing the grosser side of the female nature. Just as woman herself may rise to the highest heights or fall to the lowest depths, so have the conceptions and practices of the *shaktas* risen high or fallen low according to their natures. Similarly, those who can appreciate intellectually the phenomena of Nature, contemplate her underlying laws according to physical theory, while the less advanced prostitute the same study into witchcraft or sorcery. So it is with both *Shaktas* and pure *Shivaites*, a paradox of the very high alongside with the very low.

IV.

In closing this conspectus of the philosophy of our Aryan brother of to-day, the writer is conscious of its thinness and lack of many details. This was inevitable as space is not unlimited. In presenting it at all, the object has been to explain as intelligently and concisely as one could the fundamental ideas which underly the religion of our Aryan brother. Many of us serve in India, but few ever get at the bottom of that puzzling religion which we call Hinduism. The writer does not claim himself to have plumbed those depths. At most, he feels that he has formed some working conception of its theory and practice and, in this article, tried to present it in readable form to others. In so

doing he has not exhausted the subject either for himself or the reader. India has ever been the land of religions, and an adequate study of them would take a lifetime. Moreover, India is a land of paradoxes, and in no respect is it more paradoxical than in regard to its religions. This elementary article has presented sufficient evidence of that. When first the writer began to study the question, he regarded so-called Hinduism as a conglomerate and inchoate system of pure idolatry. Many have thought the same; but as one has endeavoured to explain in these pages, though, as practised by the masses, Hinduism at best is but symbolism carried to extremes, still as represented in its higher phases Hinduism is based on philosophical considerations of a high and subtle nature. We may not be able to agree with either Aryan premises or Aryan deductions, yet we must admit the superlativeness of the mental gymnastics which have formulated their philosophic systems. One forgets who said them originally, but there is truth in the sayings, "A man's God is himself at his highest," and "A man's idea of God is but the man himself magnified to infinity." At that we may leave it.

WATER-BOTTLES AND MESS-TINS.

By Captain N. DUNBAR WALKER,
Royal Army Medical Corps.

Water-bottles and mess-tins are an essential part of a soldier's equipment.

In order to study the principal features of these important articles it will be convenient first to describe the various types which are, or have been, in use in the armies of the chief Powers.

Water-bottles.

Great Britain.—A water-bottle has been a regular constituent of the soldier's equipment for many years.

It appears that the troops that were sent to the West Indies in 1655 were not provided with this article. General Venables[1] wrote home at that time: "Whoever comes to these parts must bring leather bottles, which are more needful than knapsacks in Ireland." These bottles were called "black-jacks."

One of the earliest types of water-carrier was the miniature wooden barrel which was in use for over a century (Plate I, fig. 3). The capacity of these barrels was about three English pints. They were supplied to the troops landing at Ostend[2] in 1794, and were still found in use during the Peninsular War. Other early forms are stone bottles with short necks, and tin bottles.[3]

The word "canteen" from early times was synonymous with "water-bottle." James in his "Military Dictionary," 1816, defines a canteen as "the tin vessel used by the soldiers on the march, &c., to carry water or other liquor in, each holding about 2 quarts.

During the Crimean War the water-bottle was made of wood and shaped like a child's drum (Plate I, fig. 2). There was no mouthpiece provided but simply a hole closed by a wooden plug or bung, secured by a catgut lace to the body of the bottle. It was painted a light blue colour.

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[1] Firth: "Cromwell's Army, 1622 to 1660." 1902.

[2] Journal kept in the British Army from the landing of the troops under the command of the Earl of Moira at Ostend in June, 1794, to their return to England the following year. Printed for the author by Merritt and Wright, Liverpool, 1796.

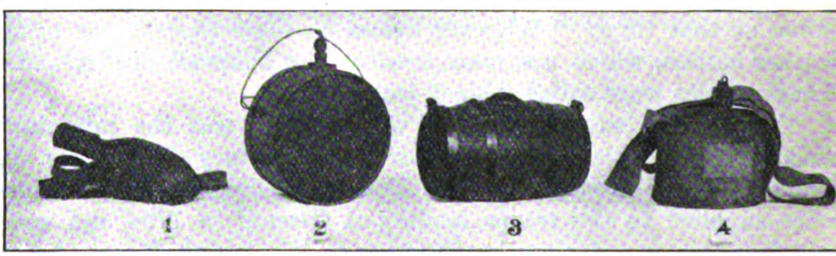
[3] Walton: "History of the British Standing Army, 1660 to 1700." 1894.

In India, during the Mutiny, ordinary glass soda-water bottles covered with leather were in use (Plate I, fig. 1). The extremely small capacity of these bottles is worthy of note.

General Eyre's Committee on Equipment (1864) recommended the adoption at home of a strong flat glass bottle instead of the Crimean type, which was then still in use. Trials made with some of the flat glass bottles used by the Prussians at that time proved them to be unsuitable.

At the end of 1873 the Italian pattern wooden bottle was introduced and remained the official pattern for the next twenty years. It is to-day the delight of many boy-scouts. In section it was an oval flattened on one side, narrow hoops of metal surrounded the ends and in the original type a metal band joined the two hoops on the oval face. The bottle was closed by means of a metal

PLATE I.



Old British Water-bottles.

1. Leather-covered glass soda-water bottle used in the Mutiny.
2. Blue painted wooden drum used in the Crimea.
3. Wooden barrel used in the Peninsular War.
4. Canvas-covered tinned bottle used in the second Afghan War.

screw stopper which was pierced by a hole plugged with a wooden peg. The bottle was first carried clipped to the belt, but later the usual method of suspension from the left shoulder was adopted.

In the Afghan Campaign of 1880 tin bottles covered with canvas were used (Plate I., fig. 4). Enamelled iron water-bottles were first officially introduced in November, 1894. There have been four definite types of these bottles. The first two were circular and flat, the earlier retaining the old pierced screw stopper, which was replaced in the second by a cork and chain (Plate II, fig. 10). The two later types are rectangular and flat, but not so thin as the

circular type, while in addition the inner surface of each is shaped to the body.

The earlier of these had a cup-shaped mouth (Mark V), but as this was found liable to collect dirt it was removed in the later pattern (Mark VI), which is the bottle now in use (Plate II, fig. 11). Both patterns have as a stopper a cork attached by a cord to the neck. All the enamelled bottles described have a non-detachable felt covering weighing in the present type 2 oz. The felt used weighs 1 lb. 14 oz. per yard of 52 in. width. The specification directs that the present bottle should be made of the best charcoal iron plate or of best steel plate perfectly enamelled over the whole surface both inside and outside. Until the introduction of the web equipment (1908) these bottles were carried over the right hip suspended from the left shoulder, but the web carrier for the bottle is attached to the belt.

TABLE I.—British Water-bottles.

Type	Date	Weight with straps		Capacity		Remarks
		lb.	oz.	c.c.	oz.	
Wooden barrel ..	Peninsular War	1	9½	1,685	59·3	Length 8½ in., diameter at extremities 4½ in.
Wooden drum ..	Crimea ..	1	7	1,670	58·7	Breadth 4 in., diameter 7 in.
Leather-covered glass soda-water bottle	Mutiny ..	1	8½	430	15·1	—
Tin (India)	1880	1	3	1,240	43·6	Canvas covered and with a canvas strap.
Wooden, Italian pattern with hook	1873	1	0¾	770	27·1	—
Do. with strap	,, ...	0	14¼	720	25·3	—
Enamelled iron ..	1894	1	2¼	930	32·7	—
,, ,, ..	Mark V. ..	1	5½	1,100	38·7	—
,, ,, ..	Mark VI. ..	1	7¼	1,170	41·2	Present pattern.
Aluminium	1912	0	15	1,200	42·4	Experimental pattern, same as Mark VI.

Experimental aluminium bottles have been on trial for some two years. The earlier types were small (30 oz. capacity), one such bottle was flask-shaped and had a detachable felt cover. It was carried in a little canvas bag suspended from the belt in the same manner as the web cage of the present water-bottle. The latest type is a reproduction of the ordinary Mark VI pattern both in size and shape.

There is no official drinking cup, but the white enamelled mug usually carried by troops on manœuvres is provided regimentally.

Many native regiments in India have adopted some form of aluminium water-bottle (Plate II, fig. 9).

France.—On the Continent in early times skin bottles were carried, and we find Marshal Saxe[1] advocating their use instead of the barrel. In the Peninsular War the French copied the Spanish goat-skin bottle.

Carré[2] records that "In 1778 a *petit bidon* was distributed to each man; one *grand bidon* was allowed per tent; two serjeants per company carried a *grand bidon* of vinegar." Napoleon's army encamped at Boulogne in 1802 was supplied with the *bidon*. Its capacity was 1 pint, and it was to be carried on the knapsack. There seem to have been complaints that these bottles became rusty and that the contents were thus spoilt. It is also recorded that the soldiers threw them away when they began the march from Boulogne.[3] Later in 1808 ½-pint glass bottles covered with straw were tried. The present bottle (Plate II, fig. 4) is made of block tin with a detachable cover of blue-grey cloth which laces up. The mouth is closed by a cork attached to a string which secures it to the neck. There is a second and smaller opening closed by a wooden plug which acts as an air inlet when the contents are being drunk. This bottle is carried by a narrow leather strap over the right shoulder and rests on the left hip, to which it is shaped. A small round tin drinking-cup is strung on this strap or carried in the haversack (*étui-musette*).

Trials have recently been made of flask-shaped aluminium bottles with corrugated sides. A cup fits over the bottom, which can be used to boil water. These bottles are no longer carried by a strap across the chest, but are suspended from the equipment.

There is a larger pattern of "bidon" issued to troops serving in Morocco, which holds 2 litres (70 oz.).

Germany (*Feldflasche*).—This article was only introduced into the Prussian Army in 1867.[4] Until the last decade it was made of thick glass (Plate II, fig. 3) covered with black leather, having a metal cup which fitted over the bottom. The mouth was closed

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[1] Saxe: "Reveries or memories upon the Art of War." 1757.

[2] Carré: "Etude historique sur le chargement du fantassin," *Revue d'Infanterie*, vol. xlii, 1907.

[3] Jean Morvan: "Le soldat Impérial, 1800 to 1814," vol. i, 1904.

[4] Kirchner: "Militär-Hygiene," 1869.

by a loose cork. It carried a swivel spring hook, by which it was attached to a ring on the haversack. It was flask-shaped and flat on both sides. The present pattern (Plate II, fig. 2) is also flask-shaped, but the inner side is slightly concave. The capacity is nearly double that of the old pattern. It is made of aluminium, and has a detachable felt cover fastening by push buttons. The mouth is closed by a metal screw cap attached to the neck by a chain. It is carried in the same way as the old pattern, and its movement is limited by a leather loop on the flap of the haversack through which the suspending strap passes. An oval-shaped aluminium drinking cup (*trinkbecher*), with a capacity of 250 c.c. ($8\frac{3}{4}$ oz.), is carried in the haversack (Plate IV, figs. 5 and 6), and has a pair of collapsible handles shaped to fit the sides.

Austria.—Formerly a glass bottle with a cover of tinned iron was in use; it was carried by a strap over the shoulder. This was followed by a pattern made of enamelled iron, covered with cloth and carried in the haversack. The present pattern (Plate II, fig. 1) of aluminium is also carried in the haversack in a pocket specially provided for it. This pattern is flask-shaped, and has no cover, the outer surface being ribbed for strength, while the inner surface is concave. It is closed by a cork attached to the neck by a leather thong.

Russia.—Formerly the Russian soldier carried a wooden bottle with zinc hoops. The pattern now in use (Plate II., fig. 6) is made of aluminium, and is flask-shaped. There is a detachable grey felt cover lacing up by means of a leather thong. The opening is closed by a loose cork. The method of carriage is from a very narrow (1 in.) canvas sling over the right shoulder, the bottle resting against the outside of the large haversack. Within the haversack there is a small aluminium cup.

Italy.—The bottle used in Tripoli to-day is identical with the "Italian pattern" adopted by Great Britain in 1873, and already described (Plate II, fig. 7). A small tin mug is carried.

Norway.—An aluminium flask-shaped bottle with a detachable grey felt cover which fastens up by push buttons is carried by a narrow black leather strap over the left shoulder. The cork has a metal top, carrying a loop, by means of which a leather thong secures it to the cover (Plate II, fig. 5).

Sweden.—The present 1906 pattern is made of green glass, the bottle is flask-shaped, with a flat bottom. One side is concave. There are three types of stopper, and commanding officers may choose the one they prefer.

Types of Stopper: (1) White porcelain stopper and rubber ring fixed by a wire catch; (2) glass stopper ground to fit the mouth, and also secured by a wire catch; (3) cork attached by leather thong to the neck.

Turkey.—The water-bottle is identical with the present German pattern, except that a cork replaces the screw stopper.

America.—The 1907 pattern of bottle was made of tinned iron, and shaped somewhat like a double convex lens, with the side towards the body somewhat flattened. It was protected by a layer of felt, over which was sewn a canvas duck cover. It was carried attached to one of the eyelet holes on the edge of the belt by a swivel spring hook (Plate VI, fig. 6). A large tin mug (Plate VI, fig. 2) was carried in the haversack, which was later replaced by a smaller one made of aluminium (Plate VI, fig. 4).

Lately an aluminium bottle has been adopted (Plate VI, fig. 7). It is flask-shaped, with a flat bottom, over which a cup fits. This cup (Plate VI, fig. 9) has a folding handle which, when opened and fixed in position, increases the stability of the cup. The nested water-bottle and cup are inserted in a canvas felt-lined receptacle (Plate VI, fig. 10), secured in position by two turn-screws. The whole is carried attached to the belt on the right side by means of the new "double-hook" attachment.

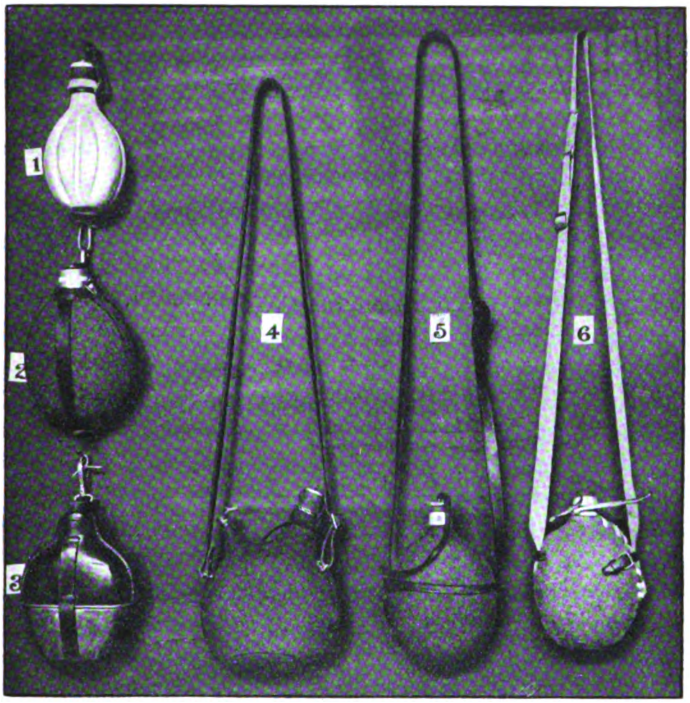
Japan.—This country uses a gourd-shaped aluminium bottle, with a flat bottom. There is no covering, and it is carried resting against the outside of the haversack in a net of leather straps, by a narrow strap over the left shoulder. The bottle is painted khaki colour (Plate II, fig. 8).

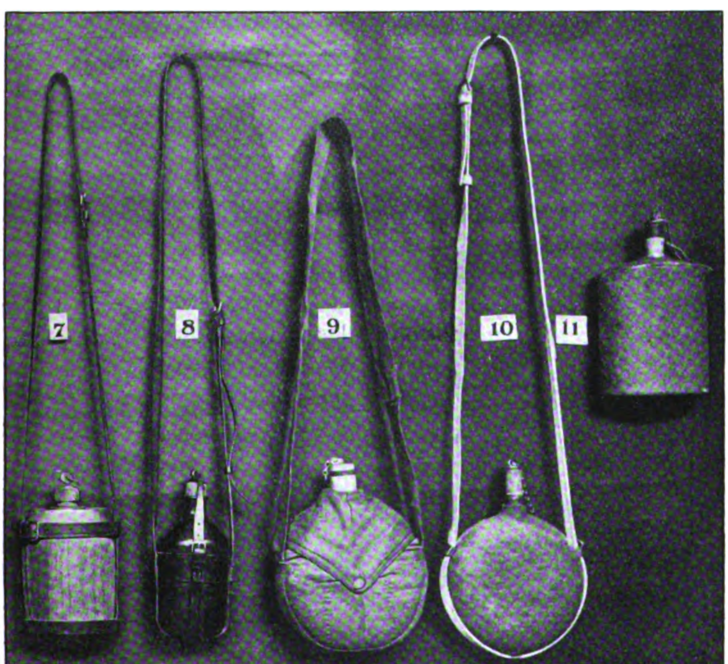
Mess-tins.

Great Britain.—Our mess-tins must be made of prime tin plate, the tin coating of which must thoroughly cover the whole surface. No pattern is to weigh more than 1 lb. 5 oz., and each is to be clearly and legibly marked with the name of the contractor and the year in which the supply is made.

The present pattern of infantry mess-tin (Plate V, fig. 5) has been in use for many years, unchanged except for the removal of a tray which in the older patterns fitted into the top of the tin.

In cross section it is almost semicircular ($4\frac{5}{16}$ by $6\frac{13}{16}$ in.), one side being flat. The body is made of several pieces jointed together. Along the upper edge on the outside four brass loops are attached at intervals. A brass wire handle is secured to two ears riveted on the sides. The lid is detachable and has hinged





WATER-BOTTLES.

1. Austrian.
2. German, New.
3. ,, Old.
4. French.
5. Norwegian.
6. Russian.
7. Italian.
8. Japanese.
9. Gurkha.
10. Great Britain, Old.
11. ,, ,, New.

Weights and Capacity, see Table II.

to it an iron wire handle enabling it to be used as a frying-pan. For packing the handle folds into the lid.

Formerly the tin was issued with a cover. In the old valise equipment (1882) the cover was made of black waterproof material and the tin was carried on the top of the valise. In the valise equipment (1888) it was carried on the top of the greatcoat roll and below the valise. In the bandolier equipment, 1903, it was secured to the waist-belt at the back and the cover was made of khaki canvas. With the present web equipment, 1908, no cover is provided and it is carried in the pack.

The cavalry mess-tin consists of two round pieces ($6\frac{3}{8}$ in. diameter), the lid which is saucer-shaped and the bottom which is cup-shaped. The bottom has a tinned wire handle similar to that attached to the lid of the infantry pattern. It is made of stouter tinned plate, but being of smaller capacity the weight is the same. Each half is blocked out of a single piece of plate and thus all joints are avoided. Experimental aluminium mess-tins for infantry are at present on trial; they are similar in pattern to the old German tins with a loose handle.

Collective Utensils.—Formerly such utensils were in use in the British Army and were carried by the men in the Peninsular War as the following order of the Duke of Wellington's shows:—

G. O. Frenda,
March 1, 1813.

(1) The Commanding Officers of Regiments of Infantry are immediately to make requisitions on the Commissaries—for tin camp-kettles to be substituted for the iron camp-kettles.

(2) Numbers are to be, one for every six N.C.O's. and men.

Each kettle to have a bag—kettles to be carried on the march alternately by the men and not on mules as heretofore.[1]

In the Crimea a large collective camp-kettle (Torrens pattern) appears to have been carried on the top of the knapsack by some men. The report of the Panmure Commission records that "on the march from the Old Fort to the Alma and during the battle most of the men threw away or lost their camp-kettles. Some divisions did not preserve even one in ten of the regulation number, viz., one to every five men."[2] When the army arrived before Sebastopol each man had to cook in his own mess-tin. Camp-

[1] Wellington, Supplementary Despatches, Correspondence and Memoranda, by F. M. Arthur Duke of Wellington, K.G. Vol. vii, p. 609.

[2] Report on Supplies of the British Army in the Crimea. First Report, 1855.

kettles were supplied in January, 1855. Every eighth man of the Camel Corps during the Egyptian War of 1884-85 carried one of these Torrens kettles.

France.—The French infantry are peculiar in that some of the men carry on the person besides an individual mess-tin larger cooking utensils (collective utensils). Until recently the individual mess tin (*gamelle individuelle*) was in the shape of a truncated cone (diameters, top 6·2 in., bottom 5 in. and depth 3 to 5 in.) and held somewhat over a litre (35 oz.) (Plate III, figs. B 1, and B 2). The lid was permanently attached to the body by a chain. It was made of tinned iron and the body was blocked out of a single piece of metal, soldering being thus avoided. This utensil was carried on the top of the knapsack resting on the camp shoes and inclined backwards so as to inconvenience the soldier in the prone position as little as possible. It was retained in position by the "load strap" which passed through two small folding handles on its body. In 1888[1], the collective utensils were abolished and the individual mess-tin replaced by one of larger size known as the "nécessaire Bouthéon."

The adoption of these mess-tins resulted in a reduction of the weight carried, which, however, was very small, 186 grm. (6½ oz.). Further, the abolition of the collective utensils enabled this mess-tin to be carried on the flap of the knapsack, thus reducing the hitherto inconvenient height of the load. In 1891 the original arrangement was reintroduced. To-day the French are falling into line with other nations and have relegated collective cooking utensils to the transport. An aluminium mess-tin (now called *marmite individuelle or marmite de campement*) with a capacity of 3 litres (5¼ pints) is now carried by each soldier on the flap of his knapsack.

Collective Cooking Utensils.—Camp-kettles or boilers (*grande marmite*) date from 1802, when Napoleon[2] introduced them and allowed eight per company when in camp. In recent years every fourth soldier carried a *grande marmite* (Plate III, fig. 1). It was kidney shaped in section and the lid had a socket for a handle enabling it to be used as a frying-pan. The principal dimensions were: depth 11½ in., longitudinal diameter 9 in., capacity 6 litres (10 pints 10½ oz.). A wire handle was attached to the body, which

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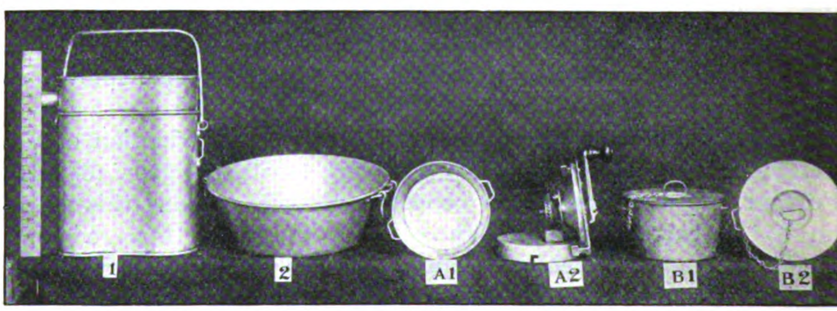
[1] L'allègement du Fantassin, Lt. Col. B., 1905.
[2] Morvan. *loc. cit.*

folded flat against the side. It weighed 3 lb. $2\frac{1}{2}$ oz. and was made of tinned iron.

Large mess-tin or pan (*grande gamelle*) one to 8 men (Plate III, fig. 2). This was similar in shape to the small mess-tin but without a lid. Dimensions, depth $4\frac{1}{2}$ in., diameters, top 12 in., bottom $8\frac{1}{2}$ in., capacity 5 litres (8 pts., 15 oz.). It was lighter by one pound than the kettle and was made of the same material.

Coffee-mills, one to 30 men (Plate III, fig. A 2). This utensil is still carried on the person within the knapsack and is now made of aluminium. The original tinned iron type was in four parts, handle, mill, strainer (*filtre klepper*, Plate III, fig. A1), and a cover fitting over the bottom of the strainer. The strainer is shaped like the *gamelle individuelle*, within which it fits. From

PLATE III.



French Utensils.

1. Camp-kettle or boiler (*grande marmite*)
2. Large mess-tin (*grande gamelle*)
A1. Coffee-mill, strainer (*filtre klepper*)
A2. Side view of coffee-mill

} Collective utensils.

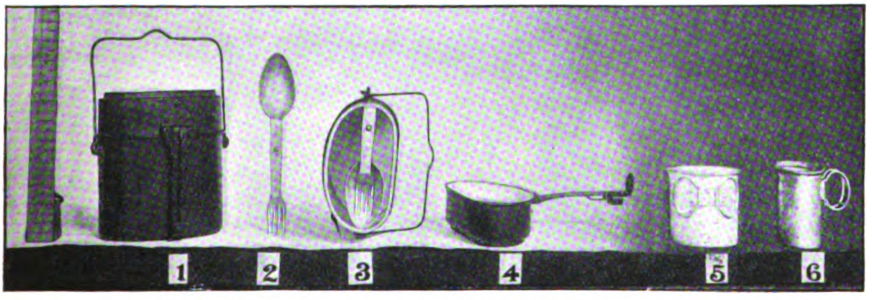
B1.
B2. } Two views of the individual mess-tin (*gamelle individuelle*).

Napoleonic times until 1884 a 6-litre (10 pts., $11\frac{1}{2}$ oz.), a *grand bidon* was carried; this clumsy and heavy utensil was then replaced by a canvas bucket.

Germany.—Aluminium has been employed for some time for the mess-tin (*Kochgeschirr*). Formerly a somewhat heavy (1 lb. 10 oz.) tinned iron pan holding $2\frac{1}{2}$ litres ($4\frac{1}{2}$ pts.) was in use. This article was kidney-shaped in section and stood $7\frac{1}{2}$ in. high and had a strong wire handle. On the adoption of aluminium the same shape and size were retained with a saving of 12 oz. in weight. A metal

piece was carried loose in the tin, which acted as a handle to the lid when used as a frying-pan, or as a hook by which the tin was suspended over the fire from its handle. The tin has now been reduced in capacity by 500 c.c. ($17\frac{1}{2}$ oz.) and is somewhat stouter in make (Plate IV, fig. 1). The edge along the bottom of the lid is so shaped that it will fit on to the body so that the lid when containing food can still act as a cover. A handle hinged to the lid (Plate IV, fig. 4) folds down flat against the side, in which position its extremity grips the bottom of the tin. The handle may be lengthened by the insertion of a stick into a D fixed at its end. Across the top of the body a combined fork and spoon is carried resting on two small projections (Plate IV, figs. 2 and 3). The interior of the body is marked off into $\frac{1}{2}$-litre divisions. Its wire

PLATE IV.



GERMAN MESS-TIN AND DRINKING-CUP.

1. Mess-tin.
2. Combined fork and spoon extended.
3. Fork and spoon in position.
4. Lid with hinged handle extended.
5. } Cup with collapsible handles.
6. }

handle folds down under the bottom. The outside is blackened all over. Each man carries one of these tins strapped to the flap of his knapsack by two straps, one of which, passing through a perforation in the handle, prevents the whole from slipping sideways.

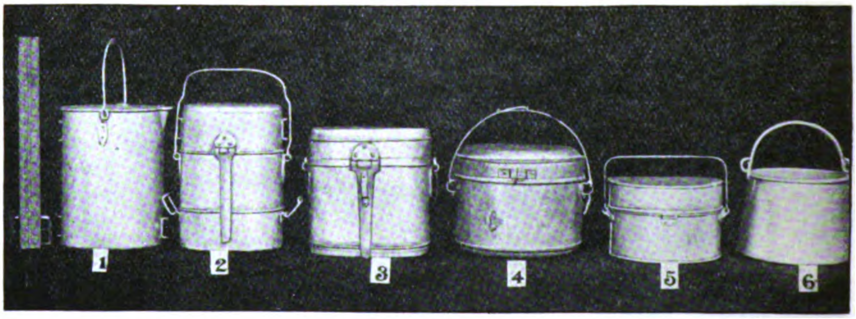
Austria.—Mess-tin (*Kochgeschirr*), one to two men (Plate V, fig. 2). This is a heavy utensil in shape a cylinder with oval section made of strong tinned iron. It consists of three pieces, a lid with a hinged handle for use as a frying-pan, a body with a wire handle and a shallow dish with two collapsible handles fitting over the bottom of the body. Placed in a brown canvas bag it is carried on the flap of the knapsack, where it is secured by means of straps which engage flanges on the lid and the handles on the dish.

Water can (*Wasserkanne*), one to eight men (Plate V, fig. 1). The can is made of tinned iron shaped as the mess-tin but with a spout, and has the usual wire handle. Half the top is permanently covered in, the remaining half being closed by a hinged lid. The spout also has a small hinged cover. It is a carried in a similar way to the mess-tin in a brown canvas bag.

The introduction of an individual tin is contemplated.

Russia.—Attached to the outside of an old Russian leather rucksack in the College Museum there is a very heavy iron mess-tin (2 lb. 13½ oz.). It has a lid and handle and is painted black. In shape it is a flattened cylinder standing 8½ in. high, with a capacity of 5 pts. 14½ oz.

PLATE V.



VARIOUS MESS-TINS.

1. Austria. Water-can, one to eight men.
2. Austria. Mess-tin, one to two men.
3. Norway. Mess-tin, one to two men.
4. Italy.
5. Great Britain } Individual mess-tins.
6. Russia.

The present tin is in shape a truncated cone and is made of aluminium (Plate V, fig. 6). It replaced the old mess-tin of copper which weighed over a pound more, but is identical in other respects. Aluminium was officially adopted in 1897, but there were some units still using copper mess-tins in Manchuria in 1905. This tin is peculiar in having no lid and it is carried over the ends of the greatcoat roll.

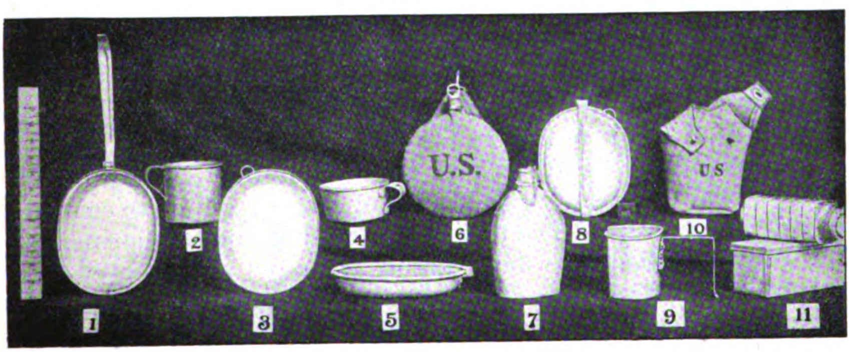
Turkey.—A large, round, flat, copper cooking utensil, not unlike the *grande gamelle* of the French Army, is carried by every tenth man strapped to the outside of his knapsack.

Italy.—The mess-tin is of tinned iron and kidney-shaped in section. The bottom of the body is rounded. (Plate V, fig. 4).

Norway.—There is only one mess-tin to two men. This is a heavy utensil made of tinned iron. The hinged handle of the lid has upon it a D through which the strap securing it to the flap of the rucksack passes. The tin is carried upright. (Plate V, fig. 3).

Sweden.—Each man carries an aluminium mess-tin similar in pattern to the German tin. It is made of stouter metal, the lid being 1½ oz. heavier than the German lid. The hinged handle of the lid has two collapsible rings on it through which a stick

PLATE VI.



U.S.A. Mess-tins and Water-bottles.

1. Mess-tin. Bottom with handle extended.
3. ,, Cover.
5. ,, Side view.
8. ,, Closed for packing.
2. }
4. } Old types of cups.
6. Old type (1907) water-bottle (enamelled iron).
7. New aluminium water-bottle.
9. Cup with handle extended.
10. Case for new bottle.
11. Bacon-can below condiment canister.

may be inserted. The stick serves a double purpose, viz., it lengthens the handle and serves as a non-conductor of heat. Along the wire handle of the body slides a large wire hook which enables the utensil to be slung from a point at some distance above the fire. There is a D on the body of the tin over which a slot in the lid handle fits. Through this D and over the handle passes the strap securing the tin in an upright position to the knapsack flap.

U.S.A.—The Americans can hardly be said to carry a mess-tin; it is rather a small oblong (Plate VI, figs. 5 and 8) frying-pan of aluminium with a cover which serves as a plate (Plate VI, fig. 3). The pan portion has a hinged handle (Plate VI, fig. 1) which turns down over the cover gripping the other side of the pan with its free end thus securing the cover in position. Until recently this was made of tinned iron. In the 1907 equipment the mess-tin was carried in the outer flap of the haversack which was then suspended from the belt. In the new equipment there is a special pocket for it on the outside flap of the haversack, which is now worn as a knapsack.

Japan.—The usual kidney-shaped aluminium mess-tin has been adopted, and this is painted or japanned khaki. A small dish fits into the top of the tin as in the older patterns of our own mess-tin. No means are provided to enable the lid to be used as a frying-pan. There is the usual folding wire handle. It is carried upright fixed to the flap of the knapsack by the load strap which passes through a D riveted to the outer convex side of the tin. Marks on the inside of the tin show the quantities of water required to cook one or two meals of rice. The tray carries the fish and condiments and the body will hold one day's ration (3 meals) of uncooked rice. Some units in Manchuria also carried on the person above the mess-tin an oval saucepan with a semi-circular handle at each side.

CONCLUSIONS.

Water-bottles.

The Method of Carriage.—A strap across the chest is in all cases objectionable; hence it is better to attach the bottle either to the belt or the haversack. In one case (Austria) it is carried inside the haversack—a practice not to be recommended, owing to the possibility of leakage. Care should be taken so to secure it in position as to avoid all possibility of its bumping against the body.

Accessibility.—It is probably better that men should not be able to drink from their water-bottles when actually marching; on the other hand, the bottles should be easy of access at a short halt. In a temperate climate, when men should only require to drink at the long halts, accessibility is not so important since equipment is always removed at these halts. In the rucksack equipment of some Gurkha regiments the bottle is carried attached to the outside of the rucksack, and, without the help of a comrade, is only accessible by complete removal of the kit. Although our

own bottle conforms with the first requirement, when properly buttoned into its case it is awkward to remove and replace in its carrier, especially if this latter be wet. The swivel attachment of the German pattern and the double-hook attachment of the new American bottle are superior in this respect—though, possibly, the bottles are so easy of access as to be detachable on the march. It is, perhaps, impossible to combine both of the above requirements in one method of attachment.

Capacity.—The most suitable capacity can be arrived at in the following manner. Even under the most unfavourable conditions, where the heat regulation is dependent entirely on evaporation, a man should not need to have recourse to his water-bottle till half an ordinary march of fourteen miles has been completed. During this time he will have lost a certain amount of water by evaporation, and from this point onwards he will continue to lose; and though a certain amount of loss is permissible without immediate replacement, still there must be some point below which the water content of the body cannot be allowed to fall without danger.

The amount of water lost by a man varies with the climatic conditions, and, further, the well-trained soldier loses water less rapidly than the untrained man. Therefore any estimation of water loss must necessarily vary widely according to circumstances.

It has been found practically that the average water loss during a seven-mile march amounts to 1,129 grm.[1] "The total amount of water present in the body of a 10-stone man is equivalent to about two-thirds of his body weight—93 lb., or rather over 9 gallons. Of this it is dangerous for him to lose as much as one-tenth, and any loss approaching one-twentieth must be replaced at a fairly early moment if efficiency is to be retained[2]."

On a give-and-take road ninety calories are expended per mile, and each calorie represents a water loss of about 2 c.c. Hence the water loss per mile is 180 c.c., or 1 litre in six miles.

One litre (35 oz.) should therefore be amply sufficient for an ordinary march (fourteen miles), and a water-bottle should hold this amount. The British, American, and French bottles are of this capacity.

If the march is prolonged beyond the ordinary limit (fourteen miles) a special allowance of 1 litre must be given for every six

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[1] "Fourth Report of the Committee on Physiological Effects of Food, Training, and Clothing of the Soldier," 1908.

[2] Melville: "Military Hygiene and Sanitation," 1912.

miles covered. With a 1-litre bottle this means the water-carts need only be indented on once in two hours, a comparatively easy matter now they are first-line transport.

Material.—Wood is distinctly objectionable. Unless the interior is coated with lac the wood imparts a taste to the water. Wooden bottles cannot be sterilized by fire, always tend to leak, and are necessarily clumsy in shape. The only point in their favour is that they keep the contents cool. The weight of glass and its fragility prohibit its use, though its immunity from chemical action is a strong point in its favour. Of the metals, tinned iron tends to rust unless enamelled, but enamelling greatly adds to the expense and tends to chip. The block tin bottle of the French is free from such objections and until the introduction of aluminium the material of this bottle was probably the best for the purpose. Almost all the Powers now employ aluminium in the manufacture of their water-bottles and its use will be discussed later in this paper.

Shape.—The following points should be noted: A flat bottom is useful so as to enable the bottle to stand alone; the inner surface should be concave to fit the body; the bottle should be flat so as not to interfere with the swing of the arm; the mouth should be shaped so as to make drinking comfortable; an extra air-hole such as is found in the *petit bidon* of the French facilitates drinking; finally the shape should be convenient for cleaning out, hence rounded corners are best.

Stoppers.—The metal screw top attached by a chain to the neck of the German and American bottles is a good method of closing the mouth, but it is liable to jam if screwed on carelessly or if there are great variations in temperature. Corks deteriorate and are easily lost. In the British water-bottle the cork can readily be changed as the metal pin which perforates is detachable.

Major Faichnie[1] has described a bottle with a press lid, detachable felt cover and a patent dust-proof stopper. He claims that this bottle can be kept thoroughly clean and that water can be boiled in it if required.

Covering.—A covering prevents the bottle clanking and glinting in the sun, and it may be moistened so as to cool the contents. The best material to use is felt. It is advisable that the cover should be detachable and a leather thong lace is superior to push buttons to secure the cover, since the latter get out of shape when

[1] JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, vol. vii, 1907, p. 251.

trodden upon and will not fasten. If the cover is not detachable[1] like our own, the bottle cannot be used to sterilize water by boiling. It is noticeable that the Japanese and Austrians have no cover.

Cleansing and Sterilization.—The following regulations deal with these points: King's Regulations, 1912, para. 1720 states that water is not to be kept in water-bottles when the bottle is not in use. Field Service Regulations (1909), Part I, para. 46 (4) draws attention to the necessity of cleaning water-bottles out and scouring them with boiling water, or chemicals provided for the purpose may be used. In the "Field Service Pocket Book" (1911), Chap. 2, Sec. 12, (5), it is recommended that bottles should be cleaned out with a mixture of 16 gr. of potassium permanganate to 1 gallon of water, or roughly 1 teaspoonful to 3 gallons. The washing with this mixture should be continued until the fluid comes out pink.

In the field it is probable that no chemicals will be available and also that boiling water in sufficient quantities to cleanse thoroughly and to sterilize bottles will be difficult to obtain. In this case, as recommended in "R.A.M.C. Training" (1911), the bottles should be filled with hot tea as near boiling point as possible and then placed aside if possible for one hour. Scouring with sand or gravel should be avoided as instead of cleansing further contamination may result. A bottle in which water can be boiled such as the American or Japanese type is excellent.

Mess-tins.

In order that the food when distributed may be used to the best advantage it is necessary that it should be well cooked and eaten hot. This will render it more palatable and assimilable and hence will enhance its energy value.

On active service the soldier should be able to cook his food quickly, wherever he happens to be, and at any time of the day. If it were necessary for him to wait for the arrival of the transport on many occasions he would be deprived of a hot meal. It is therefore advisable for each man to carry on his person some utensil for cooking. Travelling kitchens, although being generally adopted, can never enable the soldier to dispense entirely with the individual mess-tin, as such kitchens are liable to the same accidents as all transport. Further the mess-tin provides a suitable means of

[1] See Journal of the Royal Army Medical Corps, vol. ix, 1907, p. 294, for a method suggested by Captain Tate of making the cover detachable.

TABLE II.—These Figures have been obtained from actual Specimens in the Museum of the Royal Army Medical College.

Country	Water-bottles								Mess-tins								Drinking Cups					Remarks
	Material	Weight of bottle only		Weight complete with cover and straps			Capacity		Material	Weight			Capacity		Height		Material	Weight		Capacity		
		gm.	oz.	gm.	lb.	oz.	c.c.	fl. oz.		gm.	lb.	oz.	c.c.	fl. oz.	mm.	in.		gm.	oz.	c.c.	fl. oz.	
Great Britain	(1) Enamelled iron	415	15·7	660	1	7·3	1,170	41·2	Tinned plate (Infantry)	538	1	3·0	1,330	46·8	119	4·7						(1) Present pattern Mark VI } Water-bottles.
	(2) Aluminium (experimental)	210	7·4	425	0	15·0	1,200	42·4	Aluminium (1) (experimental)	436	0	15·4	2,700	95·0	190	7·5						(2) Present pattern Mark VI in aluminium
									Do. (2)	410	0	14·5	2,200	77·4	142	6·6						(3) Flask-shaped pattern (1) Weight of mess-tin with loose handle.
	(3) Aluminium (experimental)	180	6·4	405	0	14·3	870	30·6	Tinned plate (Cavalry)	595	1	5·0	1,000	35·2								(2) Ditto
France ..	Block tin ..	326	11·5	440	0	15·5	1,050	37·0	(1) Tinned iron	420	0	14·8	1,400	49·4	94	3·7	Tin ..	80	2·8	250	8·8	(1) Old *gamelle individuelle* } Mess-tins.
									(2) Aluminium	535	1	2·8	2,800	98·6	215	8·5						(2) New *marmite individuelle*, wt. with handle
Germany	Aluminium ..	176	6·2	280	0	9·9	800	28·2	Aluminium ..	370	0	13·0	2,070	72·9	190	7·5	Aluminium	56	2·0	250	8·8	Weight of mess-tin with spoon and fork, 445 grm.
Austria ..	,, ..	133	4·7	130 (no cover)	0	4·6	500	17·6	Tinned iron ..	1,010	2	3·6	3,000	105·6	234	9·2						One mess-tin to two men.
Norway	,, ..	147	5·2	300	0	10·6	770	27·1	,, ,, ..	840	1	13·6	2,750	96·8	193	7·6						One mess-tin to two men.
Italy ..	Wood	275	9·7	400	0	14·1	700	24·6	,, ,,	700	1	8·7	2,850	100·3	170	6·7	Tin ..	90	3·2	350	11·6	
Russia ..	Aluminium ..	156	5·5	270	0	9·5	720	25·3	Aluminium ..	320	0	11·3	2,100	73·9	127	5·0	Aluminium	25	0·9			
U.S.A. ..	,, ..	204	7·2	550	1	3·4	1,050	37·0	,, ..	360	0	12·7	750	26·4			,,	200	7·0	700	24·7	Weight of water-bottle includes cup.
Japan ..	,, ..	161	5·7	300	0	10·6	600	21·1	,, ..	470	1	0·6	1,800	63·4	140	5·5	,,					Wooden and tin cups were also used in Manchuria.
Sweden	Glass	300	10·6	No cover			350	12·3	,, ..	565	1	3·9	1,950	68·6	180	7·1						
Switzerland	Enamelled iron								,, ..	349	0	12·3	2,273	80·0	180	7·1	,,					
Gurkha	Aluminium ..	326	11·5	510	1	2·0	1,770	62·3	,, ..	213	0	7·5	1,200	42·2	61	2·4						

carrying the unexpended portion of his meat ration and also some utensil is necessary for each man in which to receive his portion from the travelling kitchen or from any collective utensil used to prepare his food. It is in addition the only substitute for a plate available in the field. Every country provides an individual mess-tin except Norway and Austria, in which countries every other man carries a tin for two. The latter country is now considering the adoption of the individual mess-tin.

Many of the remarks made concerning water-bottles obviously apply equally well to mess-tins. They should not catch the eye, and to avoid this most aluminium utensils are blackened, except the American, which is carried in a specially provided pocket, and the Russian and Norwegian, which have no special covering, but would probably become blackened after a few days' use in the field. The tinned iron mess-tin of the Austrians has its special brown canvas bag. Almost all mess-tins are now made of aluminium, and the points bearing upon its employment are discussed under the heading of Use of Aluminium.

Shape.—The most universal continental type is deep and kidney-shaped in section, having the lid fitted with a hinged handle. Our own mess-tin is not so deep and hence is of smaller capacity (2 pints). The size of the present 4 and 5-pint experimental aluminium utensils is preferable, though probably so large a capacity as 5 pints is unnecessary and utensils of this size have been found in practice to be rather bulky for the pack. There is also difficulty in eating from them on account of their depth. There are disadvantages in having too low a handle when manipulating the tins over a fire. It is to be noticed that the body handle of our tin is particularly low, due to the fact that the tin is so shallow and the handle must fit the bottom closely for packing. All the hinged lid handles must also necessarily be short and are very liable to become too hot to hold. The lid and body handles of the Swedish mess-tin have two convenient additions already noted to overcome these difficulties, namely, a hook on the body handle and rings on the lid handle through which a stick can be passed so as to lengthen the handle. When water is boiled in a deep tin ebullition occurs first on the surface and care must therefore be exercised that the whole contents are brought to the boiling point, especially if complete sterilization of the contents is important.

Method of Carriage.—Our mess-tin is carried at present in the pack and thus forms part of the "marching equipment," which may be left behind on going into action or when any rapid move

is in progress. When we consider the conditions which obtain in modern warfare there must be occasions when its absence will be felt and, if possible, it seems better that the soldier should not be separated from this article. In actual practice all regimental authorities are agreed that the men must not be separated from their packs unless it is absolutely unavoidable, e.g., where the men are worn out.

The only exceptions to this rule are the regimental scouts and the men of the machine-gun detachment. There is no provision for the carriage of the packs of the former, but those of the latter are carried in the limbered wagon.

The Americans provide a special pocket for the mess-tin in the "fighting" portion of their new equipment. It will be remembered that Stonewall Jackson's men retained their frying-pans even after all equipment save rifle and ammunition had been cast away, a favourite method of carriage being by inserting the handle into the rifle-barrel.[1] The Russians,[2] during their campaign in Turkey of 1877-78, were often separated from their knapsacks for long periods, but never parted with their little copper cooking pots which were normally carried fixed to their knapsacks. During their campaign in Manchuria[3] they frequently left greatcoats, tent sections and kit-bags on the ground when advancing to the attack, and on those occasions the mess-tins must have been left on the greatcoat roll. When the Japanese discarded their knapsacks during the same war, before an engagement, the mess-tin was never left behind. It was invariably secured to some part of the remaining equipment, such as the cloth holdall which replaced the knapsack, usually by means of string.

Collective Utensils.[4]—The collective utensils of the French Army are the best examples of an equipment of this type, though Norway and Austria carry a mess-tin for two, and one man in ten of the Turkish infantry carries a large utensil. The advantages claimed for such an arrangement are that food is better prepared, less fuel is required, the common pot engenders comradeship and the group of men belonging to each pot is under better supervision. On the other hand, the common pot has the disadvantages that the utensil is very heavy and cumbersome and difficult to

[1] Henderson: "Stonewall Jackson," vol. i, p. 222.
[2] Green: "The Russian Army and its Campaigns in Turkey in 1877-78," 1879.
[3] Official Reports, Russo-Japanese War.
[4] Lavisse, "Sac au Dos," 1902.

attach to the knapsack and that if its carrier is killed, wounded or taken prisoner his mess suffers the loss of the pot.

Further, it is doubtful whether fuel is saved; in the smaller tins cooking is done quicker, and if several men cook round one fire, one of them boiling water, one cooking meat and another vegetables, the idea of comradeship is still fostered.

Drinking Cups.—The infantry soldier of many continental armies (see Table II) carries one of these articles, which are, however, not officially issued to our army. They are a convenience which appears indispensable since they are always carried, being provided regimentally. If a man drinks directly from the bottle no estimate can be arrived at of the amount he has drunk, but by the use of cups control of the amount of water drunk during a march could be secured. Probably it would be better to issue them officially and replace the enamelled iron mug now used.

The Use of Aluminium.

Historical.—The French seem to have been the first seriously to experiment with aluminium for the manufacture of these articles of equipment, a Commission being appointed in 1892 to inquire into its suitability [1]. A considerable number of such articles, 15,000 sets, were manufactured and used in the Madagascar expedition of 1894, and reported upon favourably by the Commission [2].

In 1893 an inquiry into the subject was made in Germany; a report was made to the Reichstag pointing out that the adoption of aluminium would effect a great saving in weight.

Although the French began experiments in 1892, it was not until very recently that the adoption of aluminium throughout armies has become general. By 1905 Switzerland, Belgium, Germany, and Russia had officially sanctioned its use.

In the British Army during the 1910 manœuvres experiments were made with aluminium mess-tins very similar to the first German pattern. At present experiments are being repeated on a larger scale with the articles already described. Mess-tins and water-bottles of aluminium have long been in use among the native regiments of India.

At the present time, Switzerland, Italy, and Great Britain do not use aluminium for water-bottles, and Austria, Italy, Norway, and Great Britain do not employ it for mess-tins.

Although there were many difficulties, chemical and other, when this metal was first introduced, they were soon almost wholly

overcome and the great stumbling-block to its exclusive use in the manufacture of these utensils was the expense.

To-day the price of aluminium has fallen considerably and in fact a water-bottle of this metal of the same size as the present enamelled iron bottle would actually cost less.

The mess-tin is made of tin plate, a far cheaper material than the enamelled plate of the water-bottle, and to replace the tin plate by aluminium would incur considerable expense. The aluminium mess-tin now on trial would cost about five times as much as the present tin, but has double the capacity.

Physical Properties.—Lightness: The hammered metal has a specific gravity of 2·67, and as compared with pure iron (specific gravity 7·84) it is one-third the weight. The advantage of its light weight is well illustrated by the following table, from which it will be seen that for the amount of water carried our bottle is the heaviest.

Great Britain	carries	36·3	grm. of	enamelled iron	per 100 c.c.	of water.
France ..	,,	31·1	,,	block tin	,,	,,
Japan ..	,,	26·6	,,	aluminium	,,	,,
Austria ..	,,	26·0	,,	,,	,,	,,
Germany ..	,,	21·8	,,	,,	,,	,,
Russia ..	,,	21·5	,,	,,	,,	,,
U.S.A. ..	,,	19·4	,,	,,	,,	,,
Norway ..	,,	19·0	,,	,,	,,	,,

If our water-bottle were made of the lightest aluminium, namely, that used by the Norwegians, our 1,170 c.c. (two pints) could be carried by 222 grm. (just 8 oz.), which represents a saving of 203 grm. (7·2 oz.).[1]

In the same way if our present mess-tin were made of the same aluminium as the experimental tins referred to instead of 41·3 grm. weight of tinned plate being required for every 100 c.c. capacity, 14·4 grm. of aluminium could provide for the same capacity, and the total weight of such a mess-tin would be only 187·2 grm. (6·6 oz.) instead of 538 grm. (1 lb. 3 oz.), which would mean a saving of 341 grm. (12·4 oz.) Thus, retaining the present pattern of water-bottle and mess-tin, by the adoption of aluminium in their manufacture, a total saving of 1 lb. 3·6 oz. (water-bottle, 7·2 oz., and mess tin 12·4 oz.) could be obtained. If a large type

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[1] NOTE.—Since writing this paper, I have obtained a specimen of the proposed aluminium bottle (Mark VI pattern). The metal of this weighs 211 grm. (7·4 oz.), which represents a saving in weight of 235 grm., or just over half a pound.

of mess-tin were adopted similar to the experimental ones, then the saving would only be 10·8 oz. These calculations have been made from the actual utensils, stripped of covers and straps, details of which are given in Table II.

The proposed addition to the soldier's load of an "iron ration" weighing over 2 lb. makes it imperative that the total weight carried should be reduced, and the use of the metal in question is one of the methods of obtaining this result.

Conductivity. — In respect of this property, aluminium is superior even to silver, one of the best conductors known, and facilitates rapid cooking.

Other Physical Properties.—It is malleable, and articles can be blocked out. The metal may also be cast. Both these methods of working avoid the presence of joints in the completed article. The pure annealed metal bends very readily, but alloys, particularly with copper, are more resistant, and the French in their first experimental mess-tins used an alloy containing 20 to 25 per cent of copper. But, since the metal is tough, indentations in articles can be easily removed. There is no difficulty in riveting, but a satisfactory solder for aluminium is yet to be discovered. It is easily cleaned, and will take a high polish [3].

Chemical Properties.—Manufactured by the electrolytic method, it should contain over 99 per cent of pure metal, but when made by the sodium reduction process, it may only contain 97 to 98 per cent of pure metal. The chief impurities are iron, copper, and silicon. Pure aluminium does not oxidize in air at ordinary temperatures, but the presence in sufficient quantities of silicon (0·5 to 1·0 per cent) is detrimental, as this element finds its way to the surface, where it is oxidized, forming a layer of silica. Sulphuretted hydrogen has no effect on the pure metal. It dissolves readily in hydrochloric acid and the alkalies. If more than 1 per cent of iron is present, tea and meat stews prepared in such a tin are liable to act on the metal. At boiling temperature it is attacked by organic salts, but only very gradually. Organic acids attack it slightly, producing hydrogen bubbles, which adhere to the surface, limiting any further effect. The action of common salt is important. Alone its action is comparatively slow, but in the presence of acids the action is hastened. Thus some slight deterioration may be expected to occur in cooking utensils made of this metal [4].

The Germans have had some trouble with their mess-tins on account of the acid used in the process of blackening the outsides.

The blackening process is carried out as follows:—

(1) The surface for treatment is prepared with sulphuric acid, 80 per cent.

(2) It is then treated with a mixture of:—

Pure spirit	1 litre
Chloride of antimony	100 grm.
Hydrochloric acid	200 ,,
Manganous oxide	50 ,,

(3) Finally stained black by a stain consisting of:—

Spirit.
Aniline colour.
Shellac.

Certain mess-tins which had been stored for two years showed light white concretions and rough spots on the outer surface. They had been stored, standing one on the top of the other with a piece of paper between the surfaces in contact. It was at the contact surfaces that these changes were most noticeable, but they occurred elsewhere, more especially at the points at which the ears carrying the handle were riveted to the tin. It has been shown that these spots are the result of storing the tins in a damp place and of the presence of sodium chloride in the dust which settles on the tins. The salt attacks the aluminium, forming the hydroxide which is dissolved by the acid employed in the blackening process, while the presence of moisture in the store-room greatly increases the extent of this reaction.[5]

Le Chatelier [6] has made some similar observations on utensils used in the French Army, the exteriors of which are treated with gum-lac. This observer states this change is most likely to occur if the aluminium contains calcium.

It is clear from the statements made above that for storage all articles made of this metal should be kept dry and as free from dust as possible. The requirements can be attained by the use of vaseline and if possible the utensils should be thoroughly washed out with rain or, better, distilled water before storage. The French, as already stated, were the first to try such articles and the reports after the autumn manœuvres, 1894, state that the large collective utensils completely satisfied all requirements during the manœuvres, but the small equipment soon became unserviceable.

The reports from Madagascar, however, were very favourable, and a special notice is directed to the fact that sea-water had no action.

The experimental utensils of the British Army have been

examined at the Royal Army Medical College, and the mess-tin has the following composition:—

Copper, carbon, and silicon	0·960 per cent
Iron	0·464 ,,
Aluminium	98·567 ,,
	100.000

These tins (5 pint) are painted black, which slightly limits their usefulness for cooking over a fire [7]. The outside of the latest 4-pint experimental aluminium mess-tin is untreated.

Mess-tins in constant use will suffer no serious detriment provided they are cleaned, and provided meat stews are not retained in them for any considerable time.

The foregoing remarks have reference to mess-tins only.

As regards water-bottles the presence of fluids in continuous contact with the metal leads to chemical action in some cases. Aluminium forms compounds with alcoholic radicals, but the effect of alcoholic beverages on such bottles need not be considered "as it is wrong in principle to select a water-bottle on such grounds" [8]. Water containing silicic acid, like the Berlin supply, was found to act on bottles after standing in them for some time. Acid drinks should not be placed in aluminium water-bottles, but if the aluminium be pure and contains no serious trace of iron they may be filled with tea.

Except in special circumstances the chemical action of drinking water is negligible.

To sum up the advantages of the use of this metal :—

(1) Lightness, on account of its low specific gravity, thus helping to reduce the load of the soldier.

(2) Joints which may open can be avoided.

(3) Its good conductivity leads to rapid cooking and a consequent reduction in the fuel necessary.

(4) It does not oxidize easily.

(5) Its salts and oxides are innocuous.

(6) It is easily cleaned.

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SUNSTROKE—A HERESY.

By Major W. H. OGILVIE.
Indian Medical Service.

It would be a fine achievement for the Military Medical Services to clear up this ill-defined and much bemuddled subject. Our watchword, "Prevention," demands we should know more about it than we do, for so much of our life and campaigning is in the tropics. The medical officer is constantly being called upon to express an opinion on the effects of heat on human beings, and my personal opinion is that many of the opinions and recommendations are founded on misconception and are valueless.

My own efforts in clearing up this subject consist in making these few remarks and hoping that somebody else will work out the facts. Not a satisfactory attitude, I admit, but if these remarks will move some more gifted or energetic person to take up the subject then the arm-chair critic will not have criticized altogether in vain.

To plunge into the heresy straight away. Is there such a thing as sunstroke? If so, how does it differ from heatstroke? This is the question I ask after nearly twenty years of tropical service that includes much of Northern India and part of the Eastern Sudan. A heresy indeed!

My own views were greatly strengthened by reading the account of the American experiments in the Philippines, on the action of the rays of the sun on monkeys under varying conditions. Also by the invaluable experimental work of the Royal Army Medical Corps at Aldershot, on the production and loss of heat by men when marching. Both these appeared in the Corps Journal and should be carefully read by anybody who proposes to confound the heretic.

In the broadest terms disability due to the sun has been attributed to (1) the actinic rays, (2) the heat rays, and (3) a micro-organism.

The last view appears in various text-books and I confess puzzles me. Nobody in my personal acquaintance has maintained it.

The actinic rays have carried a heavy burden of sin. No proof of their guilt has yet been produced. In the Himalayan hill stations of 7,000 ft. the air is about three-quarters the density in the plains and contains less dust. The actinic rays at such a hill station are, I believe, as powerful if not more powerful than in the plains. These statements are founded on general report and

are open to correction. Compare the incidence of "sunstroke" at two places like Murree and Multan. Here is matter for thought. Next the heat rays. Again, I believe that a black bulb thermometer *in vacuo* reads as high at a Himalayan hill station as in the plains, and for the same physical reasons. Again, compare the incidence of "sunstroke" in the hills and in the plains. More matter for thought.

Statistics will afford but little help in the differential diagnosis between sunstroke and heatstroke. If the victim was bowled over in the sun the case is sunstroke, if he was in the shade it is heatstroke, the symptoms being identical in both cases. Nothing easier. History too does not help much. The introduction of *topis* in India took place at a time of sanitary awakening, when alterations and improvements were made in the whole dress, equipment and housing of Europeans.

It is hard, therefore, to attribute to each alteration its exact share in the improvement in health that followed.

To sum up my heresy: (1) There is no such thing as sunstroke, all cases of this kind are heatstroke; (2) heatstroke in the vast majority of cases is due to non-radiation of the heat from the body. This, again, is due to :—

(*a*) Deficient evaporation from the skin.

(*b*) Deficient supply of cool air to the skin.

Of these the former is the more important, and so finally we find our enemy is not the sun but the wet bulb. This I humbly suggest is the foundation of the whole matter—the relative humidity of the air. Here again the invaluable experiments at Aldershot give food for thought.

(3) Heatstroke can also be precipitated by the heat rays of the sun adding the few fatal degrees to the body surface. In hot and damp climates where evaporation and radiation from the skin barely suffice to keep the body temperature below the dangerous point the heat rays of the sun are probably the deciding and precipitating factor.

Much could be learnt during one hot weather in India by simultaneous observations at a Himalayan hill station, a hot, dry plains station and a hot damp plains station. The observations should include actinic power of sun's rays, heat of sun's rays (black bulb thermometer *in vacuo*), dry and wet bulb thermometers, incidence of cases of sunstroke and heatstroke.

The following examples show the looseness of thinking on this important subject.

In the Indian Ocean under the deck boat of a steamer a medical officer was seen with a thick cloth cap crammed over his head like a poultice. He stated that this was to avoid sunstroke and was prompted by the death of a Seedee boy in the stokehold from heat-stroke.

On the relief of Pekin—the heat and moisture being intolerable—every square inch of skin surface was crying aloud for cool air and evaporation. Need I say that several British officers had about eighteen invaluable square inches covered with a horrible tea-cosey thing called a spinal pad? And on medical recommendation too.

A case occurred in a person who had not been exposed to the sun, and was reported as "sunstroke" by the responsible medical officer. A somewhat acrid correspondence at last elicited the statement that the case was due to heat, the heat was due to the sun, *ergo*, the case was one of sunstroke.

In conclusion, I would repeat the statement made earlier, that this article does not profess to be authoritative, and that the writer will be well pleased if facts can be produced throwing light on the subject, even if his own views are demolished. At present the only advice given about the effects of heat is "Take care of the sun," and the only practical prescription for resisting tropical heat in all its forms is a *topi*.

SAND-FLIES AND SAND-FLY FEVER ON THE NORTH-WEST FRONTIER OF INDIA.

By Colonel S. C. B. ROBINSON and Major R. J. BLACKHAM.
Royal Army Medical Corps.

The investigation of indefinite types of fever is now engaging much attention and is of special interest to us in this Division, as may be gathered from the attached table, which shows the very large amount of disability attributable to the fever, or varieties of fever, which have been returned under the headings, "Pyrexia of Uncertain Origin," "Influenza," and "Sand-fly Fever" during the past four years.

Table showing Number of Admissions amongst British Troops, 1st (Peshawar) Division, for the Undermentioned Diseases from 1908.

Disease	1908	1909	1910	1911
Pyrexia, uncertain origin..	987	454	95	215
Influenza	102	420	88	62
Sand-fly	Name not introduced	Name not introduced	418	848

The condition now recognized as sand-fly fever has from time to time attracted considerable attention in this great outpost of the Empire, and has actually been called "Chitral fever," after a post in this division, in a paper by Captain McCarrison, I.M.S., published in the *Indian Medical Gazette* in 1906.

(1) Clinical Aspects of Sand-fly Fever.

There are two distinct types met with in Peshawar Valley :—

(*a*) Three-day fever type.

(*b*) Seven-day fever type.

(*a*) *Three-day Fever Type.*—The onset is very sudden and the patient complains of severe headache and pain in the back and joints. The pain in the back has usually the broken-back characters often described in relation to dengue fever. The tongue is furred and the eyes suffused. The patient feels very ill, and, as a rule, is considerably depressed.

The fever is typical. It reaches 103° or 104° on the first, but, as a rule, falls to 100° on the second day. The termination is by lysis, but occasionally a crisis with profuse sweating occurs, the

temperature dropping to normal with immediate relief to the patient. The symptoms always improve with each drop in the temperature. The liver and spleen are not enlarged, and there are no physical changes in the heart and lungs. The tongue becomes clean immediately the temperature reaches normal and remains so. In the enervating climate of the Peshawar Valley convalescence is protracted owing to the severe prostration induced by the pyrexia, but if the patient is transferred to the hills or develops the fever there convalescence is very rapid.

(*b*) *Seven-day Fever.*—This variety presents a marked contrast to that previously described. It is much less frequent than the three-day fever. The patient complains of some pain in the joints and there is usually bad frontal headache, but the general symptoms are insignificant, although the thermometer registers 103° F. or over. The saddle-back type of temperature chart, resembling very much that of the dengue fever, is frequently seen, but often the temperature is continuous for about a week, and drops by lysis on the seventh day. The skin as a rule is hot and dry. The pulse is soft, full, and *slow*, rarely numbering more than 80 per minute. Rashes are sometimes seen in this variety of fever. The mental depression is not so great in this type as in the former variety. Convalescence is even slower than in the three-day fever.

Treatment of both Varieties.—As regards treatment, rest in bed and milk diet are the first essentials. Aspirin is the only drug of any use, as it relieves the joint pains and induces diaphoresis. The disease is endemic in Peshawar and Nowshera, but does not occur at the low altitudes of Cherat and Malakand.

In Chitral, however, at an elevation of over 5,000 feet the malady occurs in epidemic form more frequently than elsewhere in the division. At both Drosh and Chitral the seven-day fever is practically unknown and all cases are of the three-day type.

Captain Graham, Senior Medical Officer at Chitral, commenting on Lieutenant-Colonel Wimberley's paper in the *Indian Medical Gazette* of August last, on the epidemic fever at Nowshera, which was, fully described in the Annual Sanitary Report of this Division for 1910, says: "I have no experience of the Nowshera type of fever, but certainly, judging from Lieutenant-Colonel Wimberley's description of it, I cannot agree that it may be said to closely resemble the three-day fever at Chitral, which in this paper I have called sand-fly fever. In the Nowshera epidemic of 1909, 77 per cent of the cases (I give Lieutenant-Colonel Wimberley's figures) had four or more days of fever, while in the Chitral sand-fly fever

less than 5 per cent had fever beyond the third day in both the 1910 and 1911 epidemics. Again, 8 per cent of the cases of the Nowshera epidemic showed a rash. Now a rash has *never* been seen in any case, as far as I know of, in the Chitral sand-fly fever. And once again it is stated in the same paper that in the Nowshera epidemic convalescence from an attack was rapid—the patient being quite well and fit for his duty within two days of the return of his temperature to normal. This is the more remarkable when it is remembered that 77 per cent of the cases had fever for four or more days. Whereas in the Chitral sand-fly fever, in which 95 per cent of the cases had fever not extending beyond the third day, convalescence was extraordinarily slow owing to the degree of prostration which ensued in the vast majority of the cases. Hence I am disposed to believe that the virus causing the three-day fever at Chitral is very different from that causing the fever met with in Nowshera."

Lieutenant-Colonel H. Fooks, of Risalpur, invites attention to a "Report on an Epidemic of Dengue Fever," consisting of both a three-day and a seven-day type, amongst the 15th Lancers at Sialkote, which was published in the *Indian Medical Gazette* for February, 1908.

In this paper he says: "The disease was spread uniformly throughout the regiment, and I am strongly of opinion that it was conveyed by sand-flies, which were very plentiful at the time on account of a very dry autumn. In the spring of 1899, when in charge of a Field Hospital at Landi Kotal, I saw over 100 cases of dengue, two cases only of which were of the seven-day fever type, and have always considered that it was caused by sand-flies on that occasion. It was certainly not due to mosquitoes, as none were present."

He further remarks that the majority of the cases of sand-fly fever that occur in the spring are of the three-day fever type, but in the autumn in a great many cases the fever continues for six or seven days, probably on account of the patients being weakened by malaria, which is more prevalent at that time.

(2) Varieties of Sand-flies.

The varieties of sand-flies found in the Peshawar Valley and the frontier posts of this Division are :—

(1) *Phlebotomus papatasii;* (2) *P. minutus;* (3) *P. molestus;* (4) *P. babu.*

(3) Observations on the Habits of Sand-flies.

Habitat.—The insects have been found in (1) barracks, (2) occupied bungalows, (3) disused houses in inhabited areas.

They are generally found on whitewashed walls, and appear to avoid painted or distempered surfaces. They affect shady places in the wall at least four and a half feet above the ground level. They are not found at an elevation above 7,000 feet and are singularly absent from Cherat and Malakand. We attribute this to the following facts: (1) That these stations are exposed and there are strong constant winds in the cooler months and dust-storms in the hotter ones which are prejudicial to the fly. (2) That the bungalows are nearly all new ones with well built, properly plastered walls which offer little facilities for the lizard or woodlouse to breed; and (3) lastly, that moisture which seems so conducive to the fecundity of the sand-fly is conspicuous by its absence in both these places.

Time of biting.—Unlike the mosquito, the insect bites all through the twenty-four hours.

Length of Flight.—We think that the length of the sand-fly's flight is very short and our experiments go to show that the insect is born, feeds, propagates its species and dies within the same bungalow and even within the same room.

Hiding-places during the Day.—Behind doors, in bath rooms and shady places. After dusk the fly descends the wall in a kind of zigzag jumps, and then flies away.

Substances which attract.—The sand-fly is attracted by three things—light, the smell of human beings, and the smell of kerosene oil.

Optimum Temperature.—Undoubtedly 70° to 90°. Below 70° the insect becomes lethargic, above 90° it again loses its activity.

Season of greatest Prevalence.—Sand-flies are most numerous during the latter part of April and the month of May. They diminish in numbers in June and July, become numerous again in August, and lessening gradually in September and October disappear entirely as the end of the latter month approaches.

(4) Probable Duration of Life.

All experiments seem to indicate that the lifetime of the full grown sand-fly is short, and that in captivity it rarely lives beyond the third or fourth day. The presence or absence of water plays an

important part in its existence, as the insect survives much longer when freely supplied with moisture.

(5) Breeding Experiments.

Twelve officers of both services made unsuccessful breeding experiments with the following varieties of material: (1) Matting and dust from bathrooms; (2) mud and scrapings from walls and corners of bathrooms and lavatories; (3) water and weeds from irrigation channels; (4) scrapings from water exits in bath rooms; (5) dust from sitting rooms; (6) sides and bottom of bathroom "diggie"; (7) old hornets' nests.

(6) Preventive Measures against Sand-fly Fever.

(1) *The Use of Mulmul Net.*—The best measure of prevention is a net of fine mesh. The material sold in the bazaars as *ab-i-rawan* is excellent, or failing it ordinary *mulmul* will do.

(2) *Early Isolation of the Sick.*—This is a measure of obvious importance, but on account of the sudden onset of the disease one rather difficult in practical application.

(3) *The Use of the Punkah or Electric Fan.*—The sand-fly is a very weak flier and a good punkah or fan is an excellent preventive against bites. To sleep on the verandah with an ordinary mosquito net is to court an attack of the disease.

(4) *Counter Attractions.*—A brightly burning kerosene lamp appears to attract the flies even more than a sleeping human being, a fact which is worth remembering when neither a fine mesh net nor a punkah is available in a sand-fly area.

(5) *Evacuation of Barracks.*—Writing with reference to malaria, the Divisional Sanitary Officer of the 2nd Division has expressed his opinion that one of the best ways of avoiding the disease was to run away from it. The same principle is applicable to sand-fly fever. This measure has been tried extensively in this Division at Drosh. The Fort, which has hitherto been a hotbed of sand-fly fever, was evacuated by June 1, 1911, with the result indicated in the following table:—

		Gurkha Sepoys	British Officers
1911.	Number exposed to infection	380	14
	Number of cases	103	9
	Percentage infected	27	64
1910.	Number exposed to infection	568	14
	Number of cases	427	10
	Percentage infected	75	71

Other factors contributed no doubt to this happy result, but the evacuation of the barracks was undoubtedly the main one.

(7) The Relation between the Incidence of the Fever and the Temperature.

We have carefully worked out the seasonal incidence of the disease and its relation to the temperature. The disease appears towards the latter half of April in Peshawar and during May in Nowshera. The heaviest incidence at both stations is during May. The disease continues right through the hot weather, but its incidence is lowest in Peshawar in July and in Nowshera during September. The disease disappears in both places towards the end of September, and is unknown during the winter months, that is from October to March inclusive.

It will be observed that there appears to be some relation between the average admission rate and the average temperature. High temperatures are usually associated with high rates of admission and low temperatures with low rates of admission. Stormy weather is often followed after two or three days by a drop in the incidence of the fever.

Clinical and other Notes.

ADAPTATION OF MOTOR TAXICAB "CHASSIS" FOR THE CARRIAGE OF WOUNDED.

By Lieut.-Colonel H. E. R. JAMES, C.B.
Royal Army Medical Corps (retired pay.)

A simple method of replacing the body of a taxicab by a structure capable of carrying one or more lying-down wounded on stretchers is much to be desired. The taxicab body cannot be made to answer this purpose by any temporary adjustments, and this applies to most covered private motor-cars, hence the commonest motor vehicles and those most suitably sprung for carrying wounded can only be used for the transport of sitting-up wounded, thus depriving us of what would be a most valuable auxiliary means of evacuating Field Medical establishments in a civilized country with good roads.

Obviously the existing motor-cab body will not take a stretcher with any comfort and may be dismissed from consideration here. To render the chassis useful a new structure must be placed upon it. There are certain qualities which must be considered in arranging the load. The springs of the cab are arranged to carry the weight fairly distributed between them longitudinally and not, as is the case in a motor omnibus, concentrated over the hind wheels; it would, therefore, be a mistake to put much weight in rear of the hind axle. Moreover, an "overhang" is considered objectionable as it increases the risk of the hind wheels skidding. The centre of gravity, therefore, must be in front of the hind axle and must be kept as low as possible, especially on inferior roads. The difficulties to be overcome are:—

(1) The driver's seat is fixed and cannot be changed; it would not, therefore, be possible to place a stretcher behind it without having an objectionable degree of "overhang," which would throw the centre of gravity too far back.

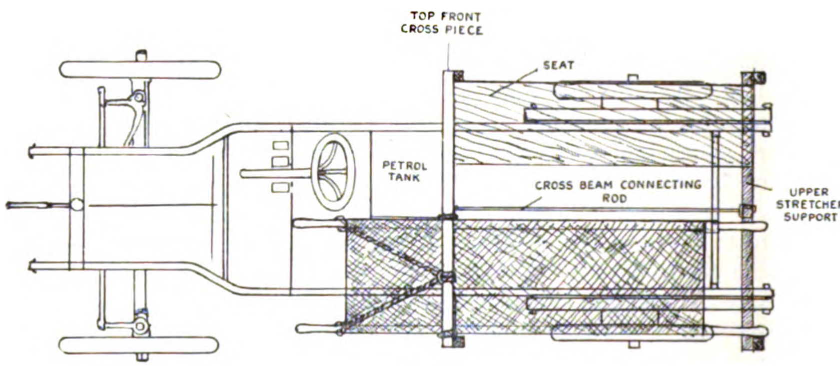
(2) To clear the wheels the lower stretcher must be not less than 1 ft. 6 in. above the level of the chassis frame, and there must be a vertical space of 1 ft. 9 in. at least, between the lower and upper stretchers; this raises the centre of gravity of the load a little above what is desirable.

The first difficulty is met by putting the stretchers on the near side of the car, the driver's seat being on the off-side; the second difficulty can be overcome by putting sitting-down men, attendants or wounded, and any additional load on the off-side.

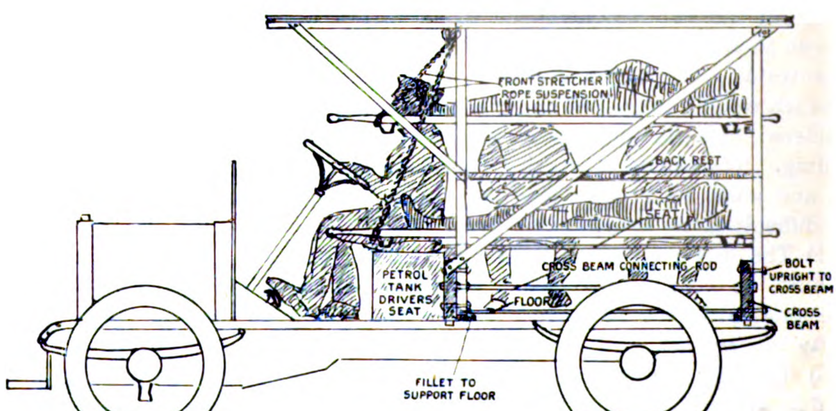
The method that I suggest is, with modifications, applicable to most taxicab chassis. The intention is to provide accommodation on stretchers for two lying-down wounded and sitting accommodation for two other

wounded, by building up from simple materials a frame which can be taken to pieces and packed for transport in a small compass. The distribution of the weight has been considered.

It will be seen that after removal of the ordinary cab body, which is easily effected, two cross beams are fixed to the chassis frame by means of iron pieces shown in the diagram. These beams are of such width



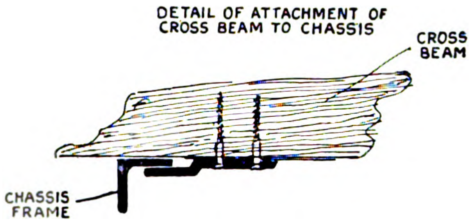
PLAN.

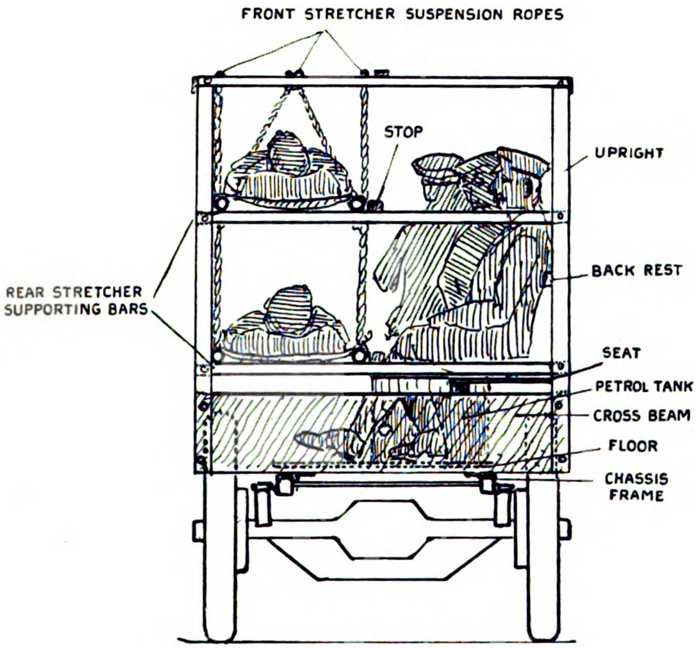


SIDE ELEVATION
SCALE ½ INCH TO 1 FOOT.

that when placed upon their edges, they raise the stretchers to be placed upon them above the level of the wheels, and are of such length as to obtain the greatest lateral room without projecting beyond the wheels. Each beam carries an upright at each end, these uprights are connected by cross pieces to support the hinder ends of two stretchers and the longitudinal slats which support the canvas roof. These uprights are

fastened to the cross beams and to their cross pieces by means of bolts and nuts. The cross beams are placed in this particular instance at 5 ft. 8 in. distance apart. (The chassis which I measured allowed the hinder beam to rest on the chassis at a comfortable distance behind the hind wheel; this would not be possible in all patterns of chassis, in which



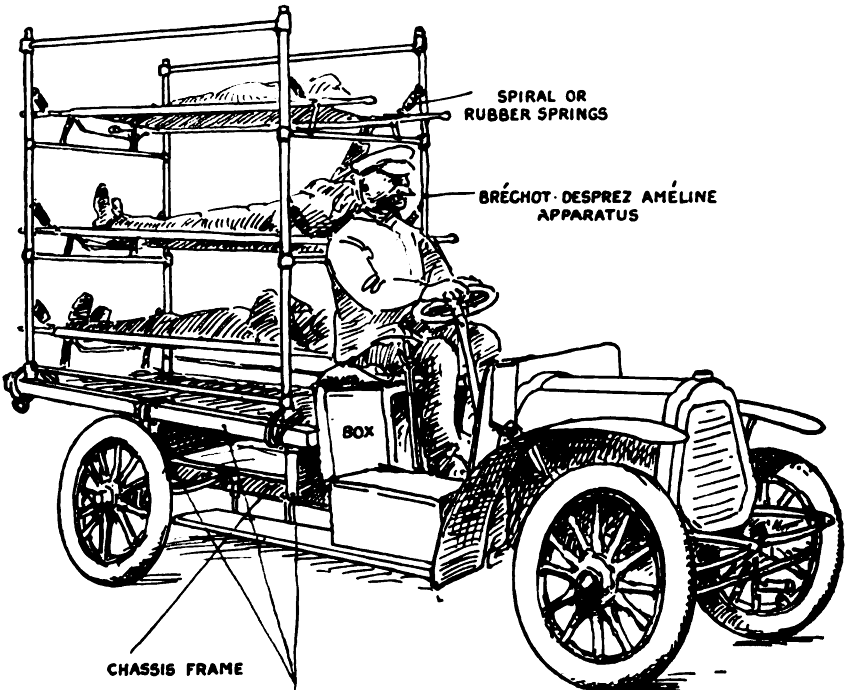


END ELEVATION

case an extension would have to be fitted upon the chassis to carry the hinder cross beam). A 1 in. round iron rod with screws and nuts is passed through the centre of each beam when it is in position and holds them together. A board floor is nailed to fillets, which are nailed to the opposing surface of the cross beams, and the space in front of the

front cross beam is boarded over so as to support the petrol tank, upon which the driver will sit. To give rigidity in the outer and posterior direction two diagonals on each side are fastened to the outside of the frame, and a back rest is fastened inside the two uprights on the off-side. A seat with a board fixed to elevations on the upper edges of the cross beams is provided for the sitting-up cases. The whole, with the exception of the front, is covered in with a light canvas tilt made in four pieces, a central one, two lateral flaps and a hind flap provided with lanyards to fix them when down, and to tie them in position when they are rolled up to the

FRENCH METHOD.



edge of the roof. The two stretchers are supported at their hinder ends upon two cross pieces to which they must be lashed, and at their front ends by ropes taking their support from the front upper cross bar. The cross beams are of pine and the uprights and cross pieces of ash of sufficient thickness for the purpose. The seat and floor boards are made of deal planking $\frac{3}{4}$ in. thick. The whole body, exclusive of stretchers, would weigh about 300 lb. and would pack into a space of about 9 ft. by 1 ft. 6 in. by 1 ft. when taken to pieces. The diagrams show the proposed apparatus in detail.

A French method of utilizing a taxicab chassis exists (see fig. page 456). The principle is the carriage of a Bréchot-Desprez Améline frame upon a platform which is supported on two wooden cross beams fixed to the chassis frame. It will be seen that there is an "overhang" and that the centre of gravity is thrown high, especially if the upper tier were occupied. The hinder cross bar is not longer than the width of the chassis frame and comes between the hind wheels; it would not carry a frame any wider than that now seen upon it.

A CASE OF BLACKWATER FEVER AND A SUGGESTION.

By Captain D. S. SKELTON.
Royal Army Medical Corps.

The following case presents features that seem in some respects so out of the common as to make it worth putting on record.

Captain P., Royal Engineers, aged 30, during a morning's inspection work at Strensall, noticed that he was passing red urine; he had been feeling seedy all that morning. He consulted an officer of the R.A.M.C. at the Camp, who advised him to return home at once, go to bed and send for medical assistance. This advice was followed. At 2 p.m., that was two hours after he had noticed the "red" urine, he passed a small amount of "porter" coloured urine. The temperature at this time was 100·5°. There was no vomiting and no obvious jaundice. Captain Patch and Lieutenant Levack, R.A.M.C., both saw the case. The temperature was normal at 5 p.m. and at 9 p.m. The urine at 5 p.m. was "porter" coloured, about 70 c.c. being passed. At 7 p.m. it was much clearer. I took over the case next morning. The temperature was normal, the urine quite clear, and the patient felt much better. Specimens of the urine passed the previous afternoon and evening had been kept for me to see. Without doubt they were typical "blackwater" specimens.

The history of the case is interesting. Captain P. went out to Sierra Leone in 1903, and completed his first tour of service. After the usual period of leave he returned to the Coast, from which he was eventually invalided in August, 1906, after a very severe attack of blackwater fever. He gives a history of having had a good deal of malaria during his West Coast tour, in fact as many as half a dozen well-marked attacks. Four months ago, that is five years and four months after leaving the Coast, he mentions having suffered from attacks of general seediness, which a civil medical practitioner diagnosed as influenza, but they were only slight, and were treated with a mixture. Except for this mixture, not all of which was consumed, no quinine in any form has been taken for 5½ years. The patient thinks that during the past six months his urine has been getting thicker. Specimens of the "porter" coloured urine

passed at the time of the attack were brought to the laboratory, and Captain Hayes, R.A.M.C., kindly assisted me in their examination. Examination of the urine under the microscope showed no red blood corpuscles, but granular casts were numerous.

The "blackwater" specimens contained albumin (a half). Several blood films were taken, one at the time of the paroxysm, the others next morning, but though Captain Hayes and I both searched for nearly two hours no parasites were found. A differential leucocyte count gave a mononuclear percentage of 7·5. On the third day the urine was quite clear and contained no albumin.

The treatment consisted in the first instance of the administration of a mixture containing liq. hydrag. perchlor. and sodæ bicarb. and later of a diuretic mixture with smart calomel purging. No quinine was given.

Second Attack.—On Monday, May 8, having just been taken off the sick list, he again began to feel seedy. At about 4 p.m. he started shivering. He passed water at 5 p.m. It was clear. At 7 p.m. he passed about 70 c.c. of "porter" coloured urine. The temperature at 9.20 p.m. was 101.

Next morning he looked very ill. There was slight jaundice, and he had that almost characteristic ashy grey colour which is associated with severe paludism. The urine cleared in the course of the day. The temperature was normal. I gave him quinine sulphate, 5 gr. doses to be taken three times a day. He continued to take this mixture till Sunday the 14th. On the 15th I expected that he might have another attack, but he did not. I assume that the quinine had done its work. There was no attack on the 22nd or on the 24th. When I last saw him he was quite well.

A medical board was held on him and long leave was recommended in order that he might go to the South.

He was advised to take ten grains of quinine each Monday and Tuesday for the next three months.

Remarks.—It is by no means rare for cases of blackwater fever to occur in England, when the patient has recently returned from tropical Africa. I myself have met with three such cases. They were all mild in type. But the case I have described above is remarkable, in that no less than 5 years and 8 months have elapsed since the patient left the West Coast. Another point is that, except for a few doses of a mixture for influenza (!) the patient had taken no quinine at all for all this time. In any case, absolutely *no* quinine had been given for four months. This surely rules out quinine as being an invariable etiological factor in the production of "blackwater," a contention that I, personally, have always held.

Supporters of the quinine school are, of course, entitled to say that the case of Captain P. was not one of "blackwater" at all. Against that I can only urge a considerable experience of "blackwater" and the want of an alternative diagnosis. The only other possible diagnoses are acute neph-

ritis and paroxysmal hæmoglobinuria. The former is ruled out, however, by the absence of red blood cells in the urine or any of the other classical signs and symptoms. The second is merely a term—a symptom with some definable cause, such as either malaria, poisonous drugs or quinine. It is not a disease *per se*. To my mind the case of Captain P. offers no doubt in the matter of a diagnosis. It was a typical mild attack of "blackwater" such as paludics not uncommonly get on returning to England. The failure to find any parasite in the blood is a common event, as after the paroxysm the parasite generally disappears from the peripheral circulation.

My idea as to the origin of such attacks of malaria after a prolonged period of immunity is that the parasite suddenly develops by parthenogenesis. No doubt the number of parasites in the host is remarkably small, hence the mildness of the attacks. The intense "blackwater" of malarial Africa is associated with all the symptoms of a virulent toxæmia, vomiting, coma, and suppression of urine. That the coma is not due to the suppression is clear, in that it frequently comes on early, in fact almost within a few hours of the onset of the attack.

Our conceptions as to the real cause of blackwater fever have not progressed much during the past five years.

Bentley and Christophers have attempted to explain the mechanism of the production of the blackwater. They have experimentally produced a lysæmia, which, they say, is brought about by an auto-hæmolysin. But then again other workers deny that an auto-hæmolysin is ever produced.

Barrett and Yorke are convinced that quinine produces the hæmolysis. They maintain that blackwater is not due to a hæmolysin. The same workers show that the suppression of urine, which is such a fatal complication, is due entirely to mechanical causes, a position I maintained in 1908. They find granular and epithelial casts in the urine of a rabbit some 12½ hours after the intravenous injection of dissolved hæmoglobin, whilst granular casts are commonly found in "porter" coloured urine.

Simpson has described a case studied before and during the malarial paroxysm. The parasites disappeared with the onset of the hæmoglobinuria. This, however, is the common experience of workers on the West Coast, that is to say the parasites disappear from the peripheral circulation.

In the case of Captain P. we have a malarial infection, the recrudescence of which can only be due to the parasite re-developing by parthenogenesis, and the same must be true as a general rule in all cases where the disease has been quiescent for any prolonged period. Have we then *here* a factor in the production of "blackwater" in general, which will help to explain in any way the elusive nature of this disease? When the parasite develops by parthenogenesis are the products of metabolism more intensely toxic than when development is by sporogony and schizogony? Much work has followed that of Ehrlich and Sachs on hæmolysins, and

the results have been applied to the production of hæmoglobinuria. But no one has explained why we get "blackwater" only in certain parts of Africa, India and the East Indies. No one has explained why we do not get "blackwater" whenever we get malignant tertian malaria.

As to the cause of the "blackwater" fever, might we not be dealing with certain "strains" of the *Plasmodium malariæ ?* Is it not possible to conceive of certain "strains" as being especially resistant to the immune bodies that are produced in the hosts? And going still further, can we not produce a strain which becomes a "super-parasite," and is resistant to quinine? Owing to unfavourable surroundings and conditions, such as the presence of antibodies in the host, &c., development may be hindered for prolonged periods, until finally parthenogenesis may occur if the species is to be perpetuated. Can it not be conceived that the large parthenogenetic forms of the *P. malariæ*, containing as they do a large amount of nuclear matter and pigment, are so intensely toxic in their products as to give rise to the condition of "blackwater"? This theory of compulsory parthenogenesis in its relation to the production of "blackwater" fever would fit in with the sudden onset and the sporadic nature of the disease, and it would also explain why paludics who have been taking quinine suddenly get "blackwater." Under the influence of quinine,[1] it can be conceived that the parasite will assume its most resistant form in its struggle for survival, an analogy to the granular stage in the life history of spirochætidæ, so that, in other words, quinine can either cure the disease or be the innocent cause of inducing the formation of the highly resistant and intensely toxic parthenogenetic form of Plasmodium.

Finally the moral of this case of Captain P. appears to be that when once a West Coast paludic has had "blackwater" we cannot promise that he will not get it again, even after an interval of years. This fact is to be commended to those who sit at home imagining that men may nowadays go out with impunity to the Coast for their health or for shooting.

It is surely an argument against any curtailment of West Coast leave, pay or privilege.

I am indebted to Lieut.-Col. N. Ferguson, C.M.G., for permission to publish this case.

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[1] The administration of quinine is said to induce crescent formation.

CÆSAREAN SECTION FOR CONTRACTED PELVIS.

By Captain S. E. LEWIS.

Royal Army Medical Corps.

Mrs. B., a primipara, aged 28 years, came to the Military Families Hospital, Devonport, on February 18th, in order to notify her expected confinement. The usual routine examination was carried out and very careful pelvic measurements were made, as the patient was only 5 ft. 2 in. in height, and marked signs of rickets were present. The date of her confinement was fixed for May 21.

The following are some of the pelvic measurements:—Interspinous diameter, 8¾ in.; intercristal diameter, 9¼ in.; external conjugate, 6 in.; true conjugate, 2¾ in.

The promontory of the sacrum was very marked per vaginam.

A second vertex presentation was also diagnosed. The urine was free from albumin.

From the above measurements it was evident that the following operations would have to be considered, viz., Induction of Labour, Symphysiotomy, Pubiotomy, Craniotomy and Cæsarean Section. The latter operation was advised, the patient's consent was obtained, and she was instructed to visit the hospital weekly.

Towards the end of pregnancy the abdomen became markedly pendulous, so that the patient could hardly walk, and as might be expected the fœtal head was always above the pelvic brim.

She was admitted to hospital on May 16, and on May 19 Cæsarean Section was performed, chloroform being administered by Major A. R. O'Flaherty.

The abdomen was opened by an incision extending 2 in. above and 3 in. below the umbilicus, and the uterus which was somewhat rotated, manipulated so that the middle line of its anterior surface corresponded with the abdominal wound. A small incision was then made in the upper uterine segment, two fingers introduced, and then the opening enlarged downwards with scissors, the entire wound being about 4 in. During this period the uterine arteries were held by my assistant (Mr. G. Roberts, F.R.C.S.) and the hæmorrhage was not excessive. The hand was then introduced into the uterus, the child's legs grasped, it was rapidly extracted, and the cord clamped and divided.

The child was in a condition of blue asphyxia, but it soon used its lungs strongly.

The placenta, which was on the posterior uterine surface, and the membranes were then removed, the cervix dilated with the finger, and ♏xv, inject. ergot. hypoderm. were introduced subcutaneously by the anæsthetist. The uterus was then brought through the abdominal incision and closed by a series of interrupted sutures of No. 4 silk passed through the

peritoneum and muscle on either side and tied, and then a second series of the Lembert variety was introduced, so as to bury those of the first row, and the uterus was returned to the abdominal cavity. There was practically no blood or liquor amnii in the pouch of Douglas.

At the patient's express wish she was sterilised by removing a portion of the Fallopian tube on each side and ligaturing the cut ends. The abdomen was closed in three layers. The patient stood the operation well.

Two hours later, however, there was profuse hæmorrhage from the vagina and the patient became somewhat collapsed, but soon revived under treatment with saline per rectum and another subcutaneous injection of ergot.

The baby weighed 7 lb. 6 ozs. and was put to the breast five days after the operation.

The abdominal wound healed by first intention, the stitches were removed on May 29. The patient was allowed up on June 9, and she and her baby were discharged on June 15.

I have to thank Mr. Roberts for his valuable assistance, and Major O'Flaherty for administering chloroform.

A METHOD OF REGULATING THE TEMPERATURE OF INTRAVENOUS INJECTIONS.

By Captain A. T. FROST.
Royal Army Medical Corps.

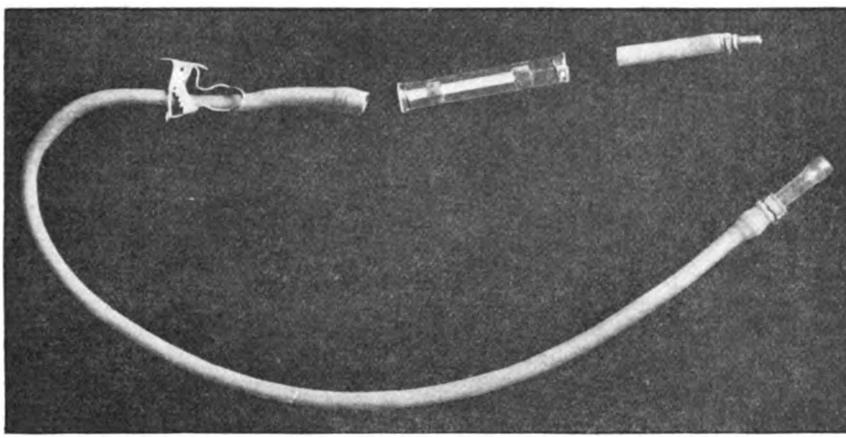
Owing to the difficulty of actually determining the temperature at which the fluids introduced intravenously reach the circulation, the following modification of a similar apparatus described by Major T. W. Gibbard, R.A.M.C., in the *Lancet*, is put forward as more easily handled, and not so easily broken during manipulation. It is so simple that the thermometer can be fitted to the transfusion apparatus for either salvarsan or saline solution, and at a small cost.

All that is required is a glass tube 3 in. long, with slightly expanded ends, so that the rubber tubing may be firmly tied on. The calibre is such that No. 12 tubing can be passed over the ends and fit tightly. The thermometer is similar to an ordinary clinical one, but is only $2\frac{1}{2}$ in. long, and differs from it in that there is no capillary break to prevent the mercury falling with a lowering of the temperature, and at the top end there is a safety expansion to avoid breakage, if the heat of the fluid should be greater than the registered scale. The thermometer registers from 96° F. to 101° F.

Two rubber corks each one-third of an inch thick are bored centrally to hold the thermometer in the "window." One cork fits over the top, and the other is slipped over the bulb as far as the constriction. Four

"V"-shaped notches are cut in each cork to allow an unimpeded flow of the solution to be injected through the tubing and over the thermometer. The rubber corks, in the proper position on the thermometer, are pushed with it into the glass tube.

As the heat of the fluid falls rapidly from the container to the needle, the nearer to the vein the temperature is registered the more accurate is



A method of regulating the temperature of intravenous injections.

the reading. The "window" is introduced 3 in. from the needle, thus acting for the double purpose of inspection and heat regulation. At a temperature corresponding to 99° F. patients feel a warm spot in the vein, at the point of the needle. The heat may be maintained at this level by means of a heating bath in which are placed a few feet of the rubber tubing.

The accompanying photograph shows the thermometer window, and rubber tubing in position, but disconnected to show the thermometer.

MALARIAL COMA MISTAKEN FOR DRUNKENNESS.

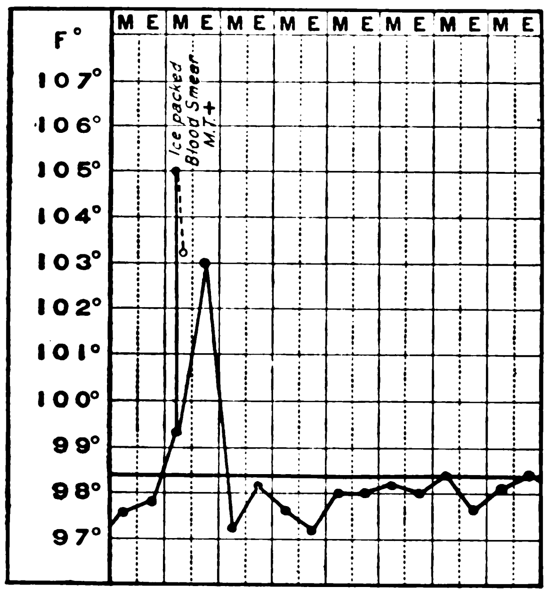
By Colonel F. SMITH, D.S.O.
Royal Army Medical Corps.

This case emphasizes the importance of never losing sight of malaria in doubtful disease conditions in malarious countries.

The conductor of a tramcar in Calcutta called the military police late at night to remove a drunken soldier from the car. The police took the insensible soldier to the guard-room, where he lay all night. About 9 next morning it occurred to the guard that the man was ill and he was carried to hospital.

The man's temperature was now subnormal. He could be roused with difficulty to mutter more or less unintelligible replies to questions. His eyes were closed ; conjunctival reflex present ; pupils ordinary in size and sensitive to light. His brows were repeatedly knitted into a frown. He was examined for injuries and for signs of poisoning. The bladder was emptied by catheter and the urine examined, with negative result.

The symptoms suggested concussion, and we made out that his head ached badly, but we could find no marks of violence. The uniform was spotlessly clean and there was nothing about the man suggestive of



drunkenness, nevertheless it was thought that he might have indulged too freely in alcohol the night before. A blood smear was examined, but the report was negative.

A dose of calomel was given. During the day the patient was induced to swallow a few spoonfuls of milk. The next morning he seemed just the same as on admission, but there was a slight rise of temperature. In the middle of the day the temperature had risen to 105° F. The man was packed in ice-water sheets, and another smear taken. A few small ringed parasites were found, only four in several fields; but the secret was out, and a good dose of quinine was given.

The following morning—the third day of his illness—the temperature was subnormal and the patient had distinctly improved, but he still lay, frowning, with his eyes closed and disinclined to speak or take nourish-

ment. Quinine was continued. Improvement was evident in the evening, and in two days the patient had quite recovered; four days later he returned to duty.

The man's own story was that he set out from Dum Dum for a walk in the evening, and knew no more till he found himself in hospital at Calcutta: this statement was accepted with reserve.

A point of interest is the small number of parasites found. We all know, of course, that a single negative result in malaria is not conclusive, and that the few parasites seen in the peripheral blood are not always a key to the extent of their prevalence in the deeper parts of the body—withal we are apt to forget these facts.

It might be suggested, of course, that this man was malingering to escape the consequences of misdeeds, and that the malaria was merely coincidental. As a matter of fact this idea also was in our mind when examining the man, a sharp cockney youth, who certainly made misleading statements after his recovery. The case would still be interesting if the above suggestion really met the case, for the malaria was genuine enough. The high temperature would not have been noticed so soon as it was if it had not been for the vigilance of the nursing sister on duty. It will be seen from the notes on the case that the discomforts attendant on the investigation of the case must have been considerable if the man were really conscious; moreover, being very young he would have been extremely hungry, whereas it was only by putting spoonfuls of fluid at the back of his throat that any nourishment could be given to him, and that in small amount. The after-recovery stories were of the sensational weekly newspaper order, one being that he had, when in England, suffered from lapses of memory as to his own name and whereabouts. He probably wanted to join a home-going party of invalids and was quick-witted enough to seize the occasion of his recent indisposition.

THE SIMPLE LIFE.

By Captain M. C. WETHERELL.
Royal Army Medical Corps.

It is surely generally accepted now that the average man eats a great deal more than is necessary for his sustenance or desirable for his well-being, and—it is submitted with diffidence—that the Army officer living in a mess eats more than the average man. The pathological effects of this consistent over-engorgement of the stomach are well described in Manson's "Tropical Diseases" in a chapter on "Tropical Liver," and less well on the advertisement pages of the Sunday papers under various headings. These effects must be responsible for a large amount of pessimism and mental lethargy among middle-aged officers, especially those who have spent a large amount of their time in India, where short

drinks and malaria are added to the white man's burden. It is the mess dinner which is almost entirely responsible for this state of affairs.

The mess parade as a rule lasts from an hour to an hour and a half, and it requires a great deal more strength of mind than is possessed by the average human unit to sit and watch others eating dishes especially prepared to tempt a palate which would refuse simpler viands. The constant eating to excess produces in addition a craving for food quite analogous to the craving for drink, not so noticeable merely because it is almost universal and because its deleterious effects are not so immediately apparent. The number of officers who frequently take purgatives of one kind or another is enormous, and the fact that men who live such otherwise healthy and active lives should have recourse to an artificial means of ridding themselves of their surplus ingesta indicates that they constantly overtax the capacity of their natural functions.

The loss of physical and mental energy in men who are below "par" from this cause alone must annually entail an enormous loss to the State (it is necessary, I believe, to claim this in any up-to-date reform); in any case it must be a lively cause of loss of efficiency.

The deadly evening meal is probably the greatest, though unrecognized, factor in producing a shortage of officers. The man with a congested liver is essentially a discontented man, and there are more than enough congested livers in the Army to make any service unpopular. It is conceivable that the supply of officers might be shown to vary inversely as the amount of uric acid in the blood of those already in the Service. The best men among combatant officers are frequently those who take most exercise, i.e., those who have sufficient physical energy to work off the deleterious influences of last night's orgy; they even are not nearly as useful as they might be, giving up, as they do, a large portion of the week to exercise which under happier physical conditions would be spent in the pursuit of their profession.

How that terrible anachronism the evening meal parade, founded by greed and continued by dyspepsia, assumed its sway is a mystery to one who has lived nine years in messes, and has ceased to care, but to the young subaltern who wants to get married the kindest advice is "Do." Bread and cheese and kisses form an infinitely more hygienic diet than the eight or ten absurdities, and the glass of port, which make up the indiscretions of an average mess dinner, and are much more likely to lead to that optimistic outlook on life which should be man's most cherished possession.

Can we as an intelligent corps, casting off the trammels of hide-bound tradition, earn the undying gratitude of the rising generation of officers who have not yet acquired the habit of over-engorgement? The answer is, I think, in the affirmative. The subaltern's choice at present lies between the fire of uric acid and the frying-pan of matrimony.

A CASE OF MALARIA CONTRACTED IN ENGLAND.

By Captain T. H. GIBBON.
Royal Army Medical Corps.

The following is of interest, although these cases crop up from time to time at home, and no doubt some of them escape notice on account of their rarity.

Private W., Special Reserve, "The Buffs," reported sick at the Military Hospital, Canterbury, on the afternoon of May 21, 1912, complaining that between 1 and 2 p.m. he had an attack of shivering, or, as he called it, "the shakes." His temperature was taken and found to be 103° F., but by 6 p.m. it had fallen to 101° F.; he was then sweating freely and complained of headache. He stated that he had had a similar attack on the afternoon of the 19th, but not so severe.

The clinical symptoms were so like malaria that several blood films were taken the following morning, and a few benign tertian parasites were found on microscopic examination. Several films were also sent to Major J. C. Kennedy, R.A.M.C., at the Royal Army Medical College, who very kindly examined them and confirmed the diagnosis.

The clinical side of the case is not of any further interest, but the following notes from the man's statements were made :—

He is only 17½ years of age; he enlisted two months ago in the Special Reserve of the Buffs and came to the Depot at Canterbury for his training. He was born in the village of Lydd, in Romney Marsh, and has never been away from home until he enlisted two months ago. None of his family have ever been out of England.

Before enlistment he was working as a butcher's assistant. During last autumn he states that he had a similar illness, the shivering or shakes coming on every third day; his description of his attack is very definite. At the same time last year he says that a good many people in the village had these attacks, including his own father, but that he cannot remember it in previous years. It is interesting to note that the man himself calls the illness "Marsh Fever."

THE CONNECTING LINK BETWEEN FIELD AMBULANCE AND CLEARING HOSPITAL.

By Captain F. W. COTTON.
Royal Army Medical Corps.

On reading over the duties of the various medical units in the field, one cannot help being struck by the weakness of the connecting link between the field ambulance and clearing hospital. When the clearing hospital comes up and takes over the wounded from the field ambulance the need for the link disappears, but in actual warfare the clearing

hospital may be something like thirty miles in rear of the army, and then we have to depend upon empty supply vehicles, local transport, and perhaps on a more or less broken-down railway or canal. Should the clearing hospital be within ten miles of the field ambulance we still have to depend on the same transport, with the addition of ambulance wagons. The Royal Army Medical Corps Training, 1911, mentions these conditions as the three most probable relations between the clearing hospital and field ambulance. The first and the third relations will work well, but in the second the strain will be very great, because we are not depending mainly on our own organization.

A new factor has lately arisen which, in my opinion, will do nothing to decrease our difficulties in evacuating wounded, but rather increase them considerably. I refer to aeroplanes; how they are going to affect us, war alone will decide, but we may be permitted to surmise. Until aircraft are brought to perfection they cannot aid us in the least, but when a dirigible is built which can be depended upon, then it might replace clearing hospitals.

In the meantime, I think that we can improve the disposition of the present field medical units either by—

(1) Making clearing hospitals mobile and keeping them up with their divisions; or

(2) Organizing the personnel of the clearing hospital into collecting and clearing divisions.

As far as I can see, the clearing hospital is the only unit which can with any safety be touched. Medical personnel with regiments is hardly sufficient for their need in action. Field ambulances already have more duties than they can perform, and have to rely on the regimental medical units for assistance, whereas if we turn to the clearing hospital we see that if it is working smoothly and well it will be generally unoccupied, for its ideal is to receive sick one day and distribute them the next. Obviously, it would be unsafe to meddle with units farther down the line, for with an increased sick and wounded ratio more hospitals would be required. To examine the two proposals which I have made, I may say at once that I am not in favour of the first, for the following reasons:—

(1) A unit with 50,000 lb. of baggage is too large to have up with a division.

(2) As soon as opened, the clearing hospital must become immobile.

(3) To clear its sick the unit must be situated at some point where there are alternative routes, e.g., road, railways to lines of communication units, if my forecast of broken roads is correct.

In examining the second proposal, some definition of collecting and clearing divisions is needed. The collecting division I have in my mind would have a very similar organization to that of a tent division of a field ambulance, and be capable of being split into three separate and distinct units. Its equipment would be purely medical and surgical, without

blankets, bedding, &c., to make the transport as light as possible. The equipment of the personnel would include a machete to enable them to carry out the work of fitting up shelters, wagons, &c., for wounded. This collecting division would be up with the fighting troops. Its duties, briefly outlined, are :—

(A) During non-fighting period :—

(1) Collecting sick and casual wounded from field ambulances as opportunity arises for their removal.

(2) Fitting up wagons for reception of sick, and finding attendants for each convoy.

(3) An intimate knowledge of the country and its resources from a medical point of view.

(4) A daily knowledge of transport available for sick and wounded.

(B) On the day of action :—

(1) Taking over the sick and wounded from field ambulances.

(2) Forming the divisional collecting station.

(3) During the fight, organizing and fitting up available transport for removal of wounded from congested area.

(4) Taking over all the wounded after an action within the shortest possible time, and staying with them until they are disposed of.

The clearing division would have a similar organization and duties, with the exception of those carried out by the collecting division, as the present clearing hospital. If it was found necessary to increase its personnel, which I do not anticipate, civilian assistance would have to be relied upon.

The objections to having a clearing hospital up with the fighting troops do not apply to the collecting division.

(1) There is not the same amount of baggage by many thousands of pounds.

(2) The unit would be constantly doing useful work without becoming immobile. It would only become immobile after an action, and then only temporarily.

(3) The difficulty of passing wounded to the rear would be much the same, but here the knowledge of the country and its resources would come into play.

What are the objections to this proposed collecting division? I can see none. It is already anticipated that the clearing hospital will have to assist in the collecting of its wounded by forming rest stations, &c. Why not go a step further and relieve the field ambulances of any part in the evacuation of sick and wounded by having the first station up with the fighting troops? Some people may object that when the clearing hospital should be at its greatest possible strength to receive wounded the personnel would be all over the place. This is not so, for the collecting division would be in charge of the wounded, and with their arrival the clearing hospital would be at its greatest possible strength. On the other

hand, there are many advantages to be gained. Field ambulances would not have to be constantly finding attendants for each convoy ; they would not be weakened during the action by having to find personnel for a collecting station or connecting links to the clearing hospital; more dressing stations could be opened in the congested areas ; and, lastly, the danger of one or more field ambulances being rendered immobile is reduced to a minimum.

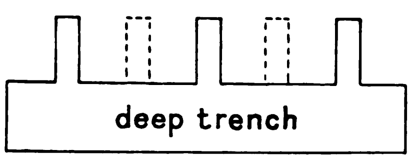
Doubtless there are other advantages and objections which I have not thought about, but as far as I can see the advantages of having a collecting division such as I have outlined, up with the troops, far outweigh the disadvantages.

A CAMP LATRINE.

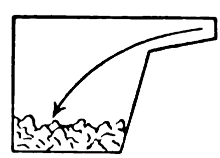
By Lieut.-Colonel S. F. CLARK.
Royal Army Medical Corps.

The new pattern of camp latrine here described seems worthy of being added to our sanitary outfit. It is best suited to a camp of one or two weeks' duration, and is a combination of the deep and of the shallow trench systems.

The latrine consists of a deep trench of any dimensions that may be desired, with a series of shallow trenches of the usual pattern running from it at right angles on one side. The men squat over these shallow



Ground Plan



Section

trenches, and so all soiling of the ground with solid or liquid excrement is obviated, while at stated intervals during the day the contents of the small trenches are raked into the large one by means of scrapers with long handles, and are covered with earth. The floors should slope backwards to assist scraping, and fresh excavations can be made in the interspaces if necessary.

Seats may be fixed over the small trenches, and shelter provided; if the deep trench is made large enough, the shelter will not require to be moved during the period of encampment.

The great disadvantage of this scheme is the raking of fæces, but if plenty of earth is used this is not such a repulsive proceeding as it sounds.

Of course each man should throw in earth as usual before leaving the premises.

The advantages of this pattern are :—

(1) Economy of ground—sometimes an important matter.

(2) Obviation of daily digging.

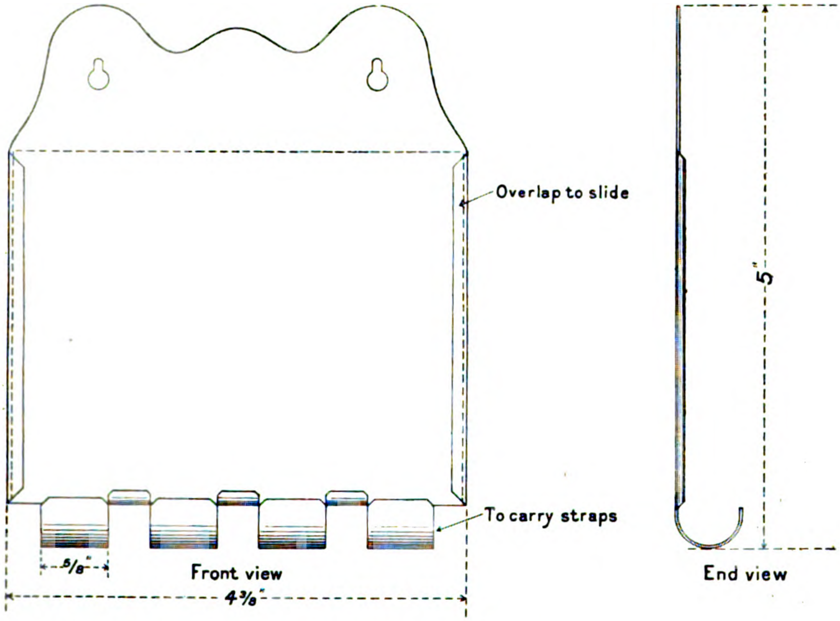
I am not an ardent supporter of this design, but it is new to me, and seems to have possibilities. I can conceive it to be very useful in a concentrated camp in war, where the deep trench economizes ground, and the small ones prevent surface soiling.

A DEVICE FOR SUSPENDING THE STRAPS OF THE VALISE EQUIPMENT, 1882 PATTERN.

By Quartermaster-Sergeant J. DAVIS.

Royal Army Medical Corps.

A tin plate is required, which holds a card bearing the N.C.O.'s or man's particulars, and differing only from the kind now in use by the addition of four hooks at the bottom edge.



These are formed by allowing about 1 in. in the depth of the plate, which is cut and turned up to form four hooks, $\frac{5}{8}$ in. in width, and allowing about $\frac{3}{8}$ in. between each; when cutting off the three pieces to form the

interstices sufficient should be left so as to form three 3-16-in. turn-ups. These form a base in which the card rests.

Two graduated holes are cut in the upper portion to allow of the tin hanging on nails fixed midway between the second and third peg provided under the soldier's shelf, or the third and fourth peg where four are provided. Should, however, the peg rail be of iron, a hook could be formed by turning back the upper portion of the tin plate.

Method of Hanging the Equipment.—The four small straps should be hung on the hooks provided on the tin plate.

The haversack is then hung over the above-named pegs, the water-bottle next, and lastly the waist-belt (which should be buckled).

It will now be seen that the tin plate, with its printed card, appears in the centre of the circle formed by the waist-belt, and need not be removed for any purpose except cleaning: the effect in a barrack room is very noticeable.

If considered necessary the words "on duty" could be printed on the back of the card, and the card reversed instead of the plate as at present.

Lectures.

UNIT SANITATION.[1]

By Capt. J. H. P. GRAHAM.

Reserve of Officers.

This lecture is entitled "Unit Sanitation," for it deals with that branch of Army Sanitation for which officers commanding units are solely responsible.

The sanitation of *areas*, such as towns, posts on the line of communication, &c., is in the hands of a Sanitary Service specially organized for the purpose in time of war; but it is to be remembered that responsibility for the sanitary control of his unit remains with the officer commanding, even though it may be brought within an area under control of the Special Sanitary Service. Unit Sanitation may then be looked on as one of those "household" responsibilities of which a commanding officer can in no circumstances be relieved.

Purpose.—The sole purpose of Unit Sanitation is to *keep the troops in the field fit and maintain the fighting line* at full strength by eliminating the causes of preventable diseases. There is no need to enter here into statistics or scientific theories in order to emphasize the importance of

[1] (A lecture delivered before regimental officers of the W. Lancashire Division, T.F.)

the matter; facts speak for themselves and the disastrous results of failure form part of the history of nearly every campaign that has been fought.

During the annual trainings in camp the results of failure may not be so forcibly illustrated, but it should be borne in mind that strict sanitation is to be aimed at during these periods, not merely to safeguard the health of troops, but to inculcate methods and habits in the individual which will result in instinctive conformity with sanitary rules under the exhausting conditions of a campaign. Habit in the individual and routine in the unit at such times will alone secure proper attention to matters not obviously directed against the enemy.

Chief Points.—The chief points that demand attention are three, viz.: (1) Water. (2) Waste materials. (3) Cases of infectious disease.

Water.—This division has had experience of some of the minor difficulties and discomforts incidental to an inadequate and dubious water supply. Unfortunately in the absence of filter water carts on the regulation scale (viz., 2 per battalion), the occasion could not be used to furnish an object lesson, nor could the problem be dealt with on approved lines; reliance had to be placed on a means of water sterilization which is ill-adapted to the exigencies of a mobile force in the field, and which in ordinary circumstances a division does not possess.

A method of sterilizing drinking water without use of special apparatus is described by Drs. Nasmith and Graham in vol. xvii., p. 50, of the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS. Essentially the method consists in dissolving thoroughly a teaspoonful of chloride of lime in about a pint of water, adding one teaspoonful of this solution to two gallons of the water to be used for drinking, stirring the mixture up and allowing it to stand for ten minutes before being used. *The condition of the water-bottle may be mentioned in this connexion.* For one reason or other water-bottles are apt to become foul, pure water put into a dirty bottle quickly takes up the impurities, so a dirty bottle may prove as dangerous in the long run as an impure supply. It may at least cause attacks of colic and diarrhœa. The importance of minor ailments in depleting ranks is apt to be overlooked, wholesale depletion by epidemics is more rapidly appreciated. Bottles before being taken into use should be inspected and cleaned out, and when in use over long periods they should be cleaned and examined from time to time. Hot water, coloured a deep red with Condy's fluid, allowed to stand in the bottle one hour is an efficient means of cleaning. Sand, gravel, &c., should never be put into bottles to scour them out; these materials may be foul, they are certainly difficult to entirely remove from the bottle.

Waste Materials.—These are of two kinds—*solid* and *liquid.* They include: (1) Refuse from cook-houses and the lines; (2) the excretions of men and animals; (3) sullage water.

Purposely an explanation of how it comes about that waste material

plays a part in originating or spreading disease is avoided; the subject is very interesting, but too complicated to enter into here. The accepted opinion to-day is, that the elimination of waste material in or about camps is essential to the good health of troops.

The *first point* to aim at is *efficient collection*, then follows the question of *disposal*.

Collection.—Scavenging the lines is much facilitated if receptacles (old tins, e.g.) are provided for tent rubbish. The men occupying a tent should be held responsible for the cleanliness of its interior and of the ground in the vicinity. The rubbish thus collected must be taken to the camp destructor at stated times. Every fourth day, weather and other circumstances permitting, tents should be struck and lightly pitched in the intervals to allow thorough cleaning and airing of the ground. On no account, however, are tents to remain for occupation on their temporary sites, since the ground may have been fouled in various ways.

Cook-house Garbage.—This is usually taken away by contractors, who supply receptacles for receiving it. But often waste materials remain which are not dealt with in this way, and in any case units must be prepared to deal with all refuse themselves. The *first point* is to provide separate receptacles for solids and liquids. The *next thing* is to make sure that after the evening meal the cooking place and utensils have been cleaned up thoroughly, and that all waste matter has been taken to the camp destructor and soakage trenches for disposal. Pits and destructors should not be constructed specially for, or near, cooking places. Nothing should be allowed in cooking places but what is required for preparing meals. Clothing must on no account be taken to these places to be dried. The personal cleanliness of cooks must be made a point of, and the fewer people allowed about the place the better. Neglect of these points makes it impossible to keep cooking places in a satisfactory condition.

There is no need to particularize about the care of *dining tents* and *meat stores;* what applies to cooking places applies equally to them. The greatest care must be taken to prevent them being used for any purpose other than that for which they are intended, and after the work at them is over for the day they must be inspected to see that they have been thoroughly cleaned up. It is the neglect of thorough cleaning daily after work is over that results in so much harm.

Disposal of Waste Solids (other than human excreta).—Everything should be burnt. Even articles which will not burn should be put into the crematory and afterwards buried. Of course, on occasion there may be tactical objections to lighting fires, burial must then be the method of disposal. Deep pits, however, must not be used because the bacteria (microbes) which help to disintegrate matter live in the more superficial layers of the soil only. The best form of destructor probably is made as follows: Dig two trenches 6 ft. long, 18 in. deep, and 18 in. wide,

n such a way that they will intersect at the centres; a chimney 3 ft. high is built where the trenches intersect, the trenches are covered over with suitable materials—*e.g.*, slates, tins, &c., to form flues and to raise the material to be burned clear of the floor of the destructor. A mud wall 2 ft. high is then built round over the open end of the flues, forming a circular structure into which the rubbish to be burnt is carefully fed. The crematory should be in charge of men of the sanitary detachment, and all camp refuse must be brought to it for destruction. Crematories, if properly constructed and intelligently used, will burn even the most sodden material; practically nothing should remain to be disposed of in any other way.

Disposal of Waste Liquids (urine excepted, dealt with later).

The chief kinds of waste liquids are *cook-house liquids* and *waste water from ablution benches.*

For the disposal of both, soak-aways must be constructed. The soak-aways for cook-house liquids should preferably be near the crematory; always, if possible, outside the lines. Those for water from ablution benches; generally, must be at the end of the benches, water can rarely be led away from them to any distance; if it can be led away so much the better.

The principles to be observed in construction and management of soak-aways for any kind of liquid are much the same.

Obviously the smaller the quantity of liquid to be disposed of the simpler the problem. Therefore every effort must be made to prevent causes of waste—*e.g.*, bad pipe joints, bad taps or too many, too many or too large wash basins, and the practice of washing or drinking at running taps. Neglect of these points means that a great deal more waste water has to be dealt with than either comfort or cleanliness entails.

The *next point* to attend to is the *elimination of greasy matters.* If grease is not strained off by means of grease-traps, interposed between the point of discharge and the soak-pit, the sides and bottom of the pit quickly become water-proofed owing to deposition of grease. Even when efficient traps are used, some grease gets through into the pit; so it is essential that every day the sides and bottom of the pit should be cleared unless, of course, the pit has been re-filled with excavated stones, &c.

In constructing soakage pits the following points should be attended to:—

Do not dig large, deep pits. The surface layers of earth are more permeable, and the extent of surface area is far more important than the holding capacity of the pit. Pits must not be more than 18 in. to 2 ft. in depth, they must be oblong or square in shape, *never circular.* A pit 3 ft. square and 2 ft. deep oosely refilled with excavated material gives very good results. In bad ground two or three of these may be dug and

if used in succession will get rid of a large amount of water. The advantage of loosely refilling pits with the material excavated arises from the fact that the deposition of greasy matter is assisted and thereby percolation is increased. Trenches 1 ft. wide, 2 ft. deep, and 6 ft. long form very good soak-aways; a series of these may be dug and used in succession. The main points are (1) that the excavations must be shallow and not too close together; (2) that grease must be strained off or removed.

A grease-trap consists essentially of a container, filled half to three-parts with rough stones, over which are placed bracken, twigs or similar materials. Into this the liquid to be disposed of is poured and allowed to flow on into a soak-pit. The best way is to take a large tin, tub, or box, perforate it at the bottom and fill it with stones and twigs on top. Place the tin on four large stones over a carefully made drain or channel leading into the soak-pit: then pour the liquid into the tin. A second grease-trap may usefully be placed between the first and the soak-pit —*i.e.*, half-way along the channel or drain leading to the pit. For example, a tub-trap is placed at the head of the channel and lower down a hole is dug, filled with stones and coarse gravel. The materials used in the grease-trap should be renewed daily, the discarded stuff being burnt. If flies collect, a little liq. cresoli, well diluted, should be sprinkled about the place.

Latrines.—In camp we use either pail-middens, or trenches. "Whatever form the latrine takes its successful conduction depends absolutely upon rigid adherence to the rule that excreta must be quickly and completely covered over with earth." (Firth, "Military Hygiene.")

The pail-midden hardly needs description, since it has been used universally by this division so far; it is only needful to bear in mind the cardinal rule just mentioned, and to accurately adjust pails under seats. Boxes or piles of earth and scoops must be available in sufficient quantity in latrines in order that the rule may be complied with. A roll of latrine paper should be issued to each tent; it is a great advantage in many ways.

Trench latrines are of two kinds, viz., the long and the short trench.

A short trench latrine is made as follows: A succession of trenches 3 ft. long, 2 ft. deep and 1 ft. wide, are dug parallel with one another, An interspace of 3 ft. is allowed. The user straddles the trench. The sod removed is carefully stacked in rear of each trench and between it and the trench the excavated earth is piled. Some means for spreading the earth over the deposit must be provided. These short trenches are used at bivouacs, temporary encampments, and during halts if required. Provision is made for 4 or 5 per cent of troops.

The *long trench latrine* is made as follows: A trench 10 ft. by 2 ft. deep by 18 in. wide is dug, the excavated earth and the sods being piled behind the trench. A bench seat, or usually a pole, is fixed along the front of the trench, about 18 in. clear of the ground, on this the user sits.

These long trench latrines are only used in camps established for periods of a week or more. Twenty feet is allowed for every 100 men.

The advantage of the long trench is that less ground is used; the disadvantages are that excreta are not so easily or completely covered, and it is very difficult indeed to prevent the ground along the front of the trench becoming fouled and eventually forming a stinking quagmire; very strict supervision is therefore necessary to ensure a satisfactory state of affairs when this form of latrine is used.

Urinals.—Buckets, tubs, &c., may be used for this purpose, the receptacles being removed daily by contractors or taken under regimental arrangements to be emptied into soak-aways. On the other hand, trench-urinals may be dug at suitable points.

Provision must be made both for day and night. During the day it is only necessary to have urine tubs within the latrines, or quite close to them. Or, of course, trench urinals may be dug there. At night suitable receptacles must be placed conveniently near the canteen; they must be removed first thing in the morning to the soak-pits, and replaced in the evening. The ground on which these receptacles stand must not be in a hollow and should be stoned over; a little dilute liq. cresol should be sprinkled over the ground morning and evening when the tubs are removed and before they are put in position again at night.

Provision for night urine in the lines must be made if wholesale fouling of the grounds is to be prevented. Empty pails, tubs, or tins, must be placed on prepared ground, marked by a light, at the centre and end of each line of tents. If pails cannot be provided, urine trenches must be dug, placed along the flanks, and covered in each morning with a few inches of fine earth.

Infectious Disease.—To assist towards the early detection of cases is what the unit commander should aim at. This object is best achieved by making arrangements for periodical inspection by the medical officer of all persons occupying the lines, or employed about them. If the "duties" are paraded separately, inspected first, and then dismissed, and if companies and equivalent formations are inspected and dismissed seriatim, very little disturbance of work or routine results. The arms and chests should certainly be bared, and if possible the legs and feet, should be uncovered at these parades. An inspection should be held as soon as possible after assembly for training, and a second one should take place before the end of the first week in camp.

March Sanitation.—On the line of march men must not be allowed to fall out to drink water or refill their bottles until some inquiry has been made regarding the purity of the supply. It is, generally, comparatively easy for the M.O. to form an opinion as to its purity or otherwise.

Also, the promiscuous way of easing themselves that men usually adopt on the line of march must be forbidden. A sanitary orderly should accompany each company or battery and be provided with a spade. He

should select a spot during halts where men may ease themselves and then inform the O.C.Coy. By removing some sods, or loosening the ground, a urinal can be quickly improvised, and a shallow excavation answers for solid excreta. Men wanting to ease themselves are directed to the spot and instructed by the sanitary orderly how to use it. Before moving off, the sanitary orderly fills in holes, and scatters a few inches of the fine earth over the place.

Personnel for this Work.—Construction is done partly by *R.E.*, and partly by *Pioneers*, but the supervision of sanitation, the final disposal of waste material, and the care of the apparatus in use must be entirely in the hands of the *Sanitary Detachment*. For these men a programme of duty for the day should be drawn up. The M.O. is advisor to his C.O. but it rests with the C.O., if he thinks fit, to give him considerable executive power. Whether the M.O. has much or little of an executive nature to perform, he must make a careful inspection daily of the lines and their surroundings and furnish a report (written, if necessary) daily to his C.O. He must bear in mind that often an intolerable nuisance arises, if nothing worse, through men repairing to woods, fields, hedges and other places near the confines of a camp to ease themselves. He must pay attention to the personal hygiene of those in his care. It is also very important that the M.O. should keep a record of men falling out on the line of march, because it enables him very often to make useful recommendations to his C.O. which tend to lessen the number of men falling out, and also in this way men who are physically unfit for service are frequently first discovered. At present the *R.A.M.C. details attached to units* to form water-squads have perforce very little in the way of "water duties" to perform. They should assist the M.O. at morning sick parade, and augment the sanitary detachment, but do not replace it, and in action they should work with the regimental stretcher-bearers. In this way their technical training can be turned to good account even in the absence of the apparatus they are intended to take charge of.

Put quite briefly, the matter resolves itself into this: The close aggregation of men and animals tends to a wide scattering of disease-producing material; our aim should be to prevent this by putting noxious matter out of action as quickly as it is formed.

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THE ORGANIZATION OF DIFFERENT ARMIES FOR THE REMOVAL OF WOUNDED FROM THE BATTLEFIELD.[1]

BY COLONEL W. G. MACPHERSON, C.M.G., K.H.P.

THE removal of sick and wounded during military operations, although it has only during the last two or three years become in the British Army a matter with which the general and administrative staff officer has to be more or less acquainted, has long been a subject of study in Continental countries, more especially in Austria. Austria during the wars of the 18th century was fortunate in having a monarch, Joseph II, who had direct personal knowlege of war, and who saw for himself the neglect and distress that was being caused by the system then generally adopted of treating the sick and wounded as near their regiments as possible.

The experience of the war of the Bavarian Succession and previous wars showed how greatly armies were hampered by retaining with them or in their neighbourhood sick and wounded who required prolonged treatment; and it was under Joseph II's influence that the principle of basing field medical organization on a system of evacuation of wounded was first enunciated. The organization he adopted was that of a series of mobile and other hospitals, along a long line of evacuation, in order to remove such cases as far as possible from the zone of hostilities and give them at the same time opportunities of treatment under conditions free from anxiety and disturbance.

It was long, however, before other countries learned these lessons, although during the Napoleonic wars the Austrian Contingent became famous for the skill and care with which arrangements for evacuation of its sick and wounded were carried out. The Austrian organization for dealing with masses of wounded and evacuating them to fixed hospitals attracted the attention of the Commanders of the Prussian and Russian armies during the War of Liberation, and after the battle of Leipzig they sent their Principal Medical Officers to study and imitate it.

The principle thus practised in the latter part of the 18th century by Austria is definitely formulated in Von Schellendorf's "Duties of the General Staff," where he states that the system of evacuating sick and wounded forms the basis of the entire medical service in the field.

We ourselves have been particularly slow in grasping these ideas, chiefly because we have never in modern times had to deal with large masses of wounded. As an instance of our failure to grasp these principles, I might point out the organization of the Territorial Forces, where no provision in the original scheme was made for the evacuation of

[1] Lecture delivered before the Military Society, Quetta.

wounded. Field ambulances were well organized and a scheme for providing general hospitals in different parts of the country was put on paper; but no provision was made in the first instance for bringing the wounded from the field ambulances to the general hospitals. I understand that the reason for leaving out the essential links in the system of evacuation in England was that the idea prevailed that the wounded would be taken over from the field ambulances by the various townspeople and villagers in the neighbourhood, leaving their removal from there to the general hospitals a matter of chance, or haphazard organization whenever the need or opportunity arose. This, however, would have created exactly the same situation which led Austria in the 18th century to think seriously of the necessity of adopting a complete system of evacuation. If matters were to remain in our Territorial Force as had originally been intended, we would have the same historical experience as the Austrians had then, should the Territorial Force ever be engaged in actual war.

A somewhat similar state of affairs existed in the reorganization of our field medical service after the South African War when bearer companies and field hospitals were made into one unit, namely, the field ambulance, without providing any link between it and the lines of communication. This was subsequently remedied to some extent by the introduction of the unit called the clearing hospital.

Historically then, there has gradually been evolved in all armies, commencing with Austria in the 18th century and ending with ourselves in the 20th, a system of removal of sick and wounded which has become a distinct branch of staff work in the field.

The failure to recognize it as a concern of staff officers has been at the root of the so-called medical scandals of war. We, that is to say, the British Army Medical Service, have specially suffered from this. So have the French. So, too, have the Russians. In the Crimean War the sick and wounded of the Russian side were collected in Sebastopol and Simferopol, their advanced depot, with no organization for removing them. The conditions there became so distressing that trying journeys over the Steppes into the interior of Russia by rough means of transport were regarded by the wounded as a blessing. On our side we had equally bad conditions under the old system of regimental hospitals, with nothing but haphazard arrangements behind them. The French lack of a system of evacuation at Solferino provided the theme which led to the formation of Red Cross Societies and the Geneva Convention. Mr. Burdett Coutts's attack on the Medical Service at Bloemfontein was to some extent due to the fact that field hospitals were clogged for want of any recognized staff system of regulating how sick and wounded were to be dealt with under the conditions which arose.

The Austrians had no such scandals. Even in the disastrous opera-

tions leading to the battle of Koniggrätz on July 3, 1866, where they had 5,800 killed, 17,800 wounded and 7,800 missing, they were able to remove 11,000 of the more lightly wounded to Vienna along a definitely organized line of evacuation between it and Theresianstadt, before their decisive defeat. Only the serious cases were left in the hands of the Prussians on July 3.

In the Russo-Japanese War the Japanese had a perfect system of evacuation, based on the existing German field medical organization. The extent to which it was worked may be grasped from the fact that out of 146,813 wounded admitted to field hospitals, 112,661, or 76·8 per cent, and of the 221,136 admissions for sickness 168,926, or 76·4 per cent, were removed to the fixed hospitals in Japan. The majority of the 7,742 Japanese wounded during the battle of Heikoutai between January 26 and 30, 1905, were comfortably in hospital at Dalny on February 4 and 5 waiting embarkation. The excellence of the system which could have achieved this rapid removal of wounded is more readily realized when it is remembered that the battle was fought at least one and a half days' march from railhead, with a temperature varying from 1° to 10° F., and with snow falling heavily on the two days, January 26 and 27.

I mention these facts because they give some idea of the extent to which the subject of removing sick and wounded has been studied in other countries, and of the success which has been achieved as the reward of clear thinking and adequate organization. Those of you who know how complicated and elaborate are the details which must be gone into in order to move an army of healthy men will realize how equally carefully detailed must have been the organization which could move without a hitch close on 300,000 sick and wounded from the battlefields in Manchuria to Japan.

In the official Medical and Sanitary Reports of the Russo-Japanese War you will find sketched diagrammatically the system by which this was done, and I propose in this lecture to show how far the principles should be or are applied in the field medical organization of our own and other armies.

In the first place, you will see that the system is divided into three zones—the collecting, the evacuating, and the distributing zone. Practically all armies have adopted this system of zones; and we have embodied it now in the British Feld Service Regulations, Part II. of 1909, of which a Provisional Indian Supplement was in proof in 1910.

The collecting zone is the zone in which the sick and wounded are collected from their various units and brought to a definite point (generally speaking the advanced depot or rail-head) by the agency of regimental medical arrangements and field medical units.

The evacuating zone is, so to speak, the handle of a fan formed by the convergence of the collecting zone ramifications. It commences at the point where the ramifications of the collecting zone converge, and extends

generally down the whole of the lines of communication to a sea or home territory base. The agencies of evacuation in this zone are chiefly ambulance trains, hospital ships or other means of convoy by road, rail or water.

The distributing zone is in a way comparable to the collecting zone, with this difference that the work in it, instead of converging to the evacuating zone, diverges from it and spreads over the whole of the interior of a country where there are fixed or permanent hospital establishments, convalescent depots, and so on.

At the point of convergence of the collecting zone with the evacuating zone, and at the point of divergence of the distributing zone from it, important medical arrangements have to be made. At the former, in the British and French organizations, there are the clearing or evacuation hospitals, and in other armies similar arrangements are made under different names, which can be explained later on.

To take the collecting zone first:—

The main object of the medical service in it is to bring the wounded as rapidly as possible to the advanced depot or rail-head, surgical work being confined to applying temporary dressings, performing emergent operations for saving life, or rendering wounded fit for transport.

For this purpose there are:—

(1) A regimental medical and stretcher-bearer service.

(2) Special field medical units composed of stretcher-bearer, dressing station and hospital service.

(3) Clearing hospital services.

The regimental medical service does not work during an action over a depth extending much beyond half a mile behind the fighting line; generally its sphere of work does not extend further back than the position of the regimental reserves.

Most armies have much the same system of regimental work in this connexion; that is to say they have regimental bearers in the proportion of sixteen per battalion. The new Field Service Regulations of the French Army promulgated last year give a clear definition of the limitations of this service in the work of removing wounded. It is directed to form small shelters for wounded behind any natural protection in the ground over which the battalion is fighting, wounded unable to get there by themselves being carried by the regimental stretcher-bearers as opportunity offers. At these shelters or "Aid posts" as they are called, the wounded receive first aid, and those who are able to walk are directed to make their way to definite positions further back. Others remain until the field medical units get in touch with the regimental medical service, when they are carried to the main dressing stations, and thence to field hospitals.

In the British and Indian Regulations there is nothing definitely laid down as regards the formation of regimental or battalion aid posts to

which wounded should be removed regimentally. Otherwise the limitation of regimental work is the same.

Perhaps the most elaborately organized regimental medical service is the Russian, where a regimental field ambulance with 128 bearers, 32 stretchers, 4 ambulance wagons, a dressing station, tents and equipment for a 16-bed field hospital from part of the regimental medical service of each 4 battalion regiments but the work done in action by this organization is more that of a brigade ambulance than of a regimental medical service in the strictly continental sense of medical tactics. In Austria-Hungary the regimental medical service works somewhat differently from that of other armies. It is massed during an action to form one regimental aid post for a group of battalions, the grouped battalion bearers forming a bearer company for bringing the wounded from the fighting line to it.

As a contrast to this, the Japanese, in the Manchurian battles, generally formed aid posts for each battalion. They were placed under cover of a ravine, behind a mud wall, or in a village temple or house as close to the objective of the fighting line as possible. There was never any difficulty in keeping in touch with the fighting line, because the rate of advance if many casualties were occurring was very slow; often not much more than a few hundred yards a day. When the advance was rapid, there were only isolated casualties, which could be dealt with rapidly and left to the field medical units coming up behind.

The field medical units, which collect the wounded from the regimental medical service, and take temporary care of them until they can be removed to the head of the evacuating zone, work in two echelons in most armies. The first echelon in practically all armies is of the nature of bearer companies, with a dressing-station party, which are under the control of the Divisional Administrative Medical Officer. In our Army, until after the South African War, the units of this echelon were brigade units.

All armies recognize the necessity of having this first echelon composed of a stretcher-bearer unit with a dressing-station party. This principle, however, was not given effect to when our bearer company and field hospital were amalgamated into a field ambulance after the South African War; for the bearer division of our field ambulance has no dressing-station, although it is intended to represent the old bearer company. It has to borrow its dressing-station from the tent division, which represents the old field hospital, and which essentially belongs to the second echelon of field medical units. This organization of our field medical unit makes it somewhat difficult to draft operation orders which provide for the movements of the bearer division of a field ambulance, because something has to be added to indicate that a portion of the tent division must accompany it as a dressing-station. The new French Regulations make the bearer company a kind of bearer convoy, as a

separate unit from the dressing-station; and in this respect it is similar to the bearer division of the British field ambulance; but its field ambulance is essentially a dressing-station in itself, with so-called "hospital sections" brought up and tacked on to it whenever wounded have to be taken over from it as they would be in the field hospitals of other armies, or in the tent division of the British field ambulance.

But neither the British nor the Indian organization has quite the same divisional bearer company arrangements as in that of the continental armies and of Japan. In these armies the division has what is practically a divisional bearer battalion of two or more companies commanded by combatant or non-medical officers, but with an additional or head-quarters section, under a medical officer, composed entirely of medical personnel and equipment for the purpose of forming a main dressing-station.

In Austria-Hungary, on the other hand, there is no bearer company. The whole of the stretcher-bearer work of removing wounded is done in the area over which the grouped battalion bearers work, as already noted, the work of removing wounded from the regimental aid posts being carried out entirely by wheeled transport from the ambulance of the division. The position of the regimental aid posts is determined accordingly, *i.e.*, they must be at or near a position to which wheeled traffic can be brought up.

The Germans and the Japanese have practically only one kind of ambulance, namely, a divisional field-ambulance or bearer-battalion equipped for work with infantry. Other countries such as the French, Austro-Hungarian, Italian, and British have cavalry field ambulances, specially equipped for moving with cavalry divisions. In India there is a fast moving hospital, now called Indian cavalry field ambulance; but it is not different from the slow moving field hospital or field ambulance, as it is now called, except in transport, and can scarcely be called a *specially* organized cavalry field ambulance.

It may be noted here that, as a result of the South African War, the British Cavalry Division is by far the best endowed of all armies in respect to cavalry field ambulances, the field ambulances of the French, Austro-Hungarian, and Italian Cavalry Divisions or Brigades being much smaller and fewer.

Some armies, notably those of Italy and Austria-Hungary, have ambulances specially organized for warfare in mountainous countries, with pack animal transport, special apparatus for carrying wounded on the backs of bearers, and detailed regulations as to how they work during an action. The Italian regulations, for example, on this point are instructive. The mountain ambulance of Italy has two light sections, with a dressing-station party each, and one complete infantry division field ambulance as a head-quarters' section. This head-quarters' section opens in a valley or accessible place near the spurs over which the

fighting is taking place, and where there are roads, while the light sections go up the heights on either side of the valley and open advanced dressing-stations as high up as may be necessary to keep in touch with the medical service of the fighting units. They form there shelters for the wounded, who are then brought down to the main dressing-station below by relays of bearers.

The work of removing wounded to the main dressing-stations of field ambulances is carried out in some armies, such as the Japanese, entirely by stretcher-bearers, *i.e.*, by the bearer companies; in the Austrian entirely by wheeled transport; in our own army, and in most other armies partly by stretcher-bearers of the ambulance and partly by wheeled ambulance transport; while in the French Army not only stretcher-bearers and wheeled transport but pack animal transport all form part of the ambulance transport for removing wounded to the dressing-stations.

The depth over which ambulances, i.e., bearer companies, work is determined by two considerations: (1) by the necessity of bringing wounded as far back out of the zone of fighting as possible, and (2) by the distance over which stretcher-bearers or wheeled transport of the unit can work without losing touch either with their own unit on the one hand, or with the regimental medical service on the other. In the battles in Manchuria the Japanese ignored artillery fire, as they found it impossible, with stretcher-bearers as the only means of transport, to place the dressing stations further back than about one mile or even less from the regimental medical service. They were consequently frequently exposed not only to severe artillery fire but also occasionally to rifle fire. When ambulances have both stretcher-bearer and wheeled transport, positions fairly safe from field artillery may be selected for the dressing stations.

In connexion with the question of stretcher-bearer transport of field ambulances, it may be interesting to note that in the army of United States of America only two bearers are given to each stretcher, most armies allow four, and the British six, just as in India six are allowed for the dandy. I will not enter into a discussion as to the reasons of this difference in the number of bearers for each stretcher; but it may be noted that some experiments were made in the United States to test the carrying powers of two bearers with unexpectedly favourable results. Yet for the arduous work of collecting wounded when there are large numbers to deal with, two bearers per stretcher would undoubtedly be insufficient, just as six are probably more than enough.

The second echelon of medical units, in the process of collecting and removing wounded from the battlefield, is the field hospital. In this echelon the organization of different armies varies considerably. In the British the echelon no longer exists except in the form of the tent divisions of field ambulances, and in the Indian organization the term field hospital, as applied to a medical unit, has also disappeared.

In Japan it forms an important divisional echelon of four field hospitals of 200 beds each, under the control of the Divisional Principal Medical Officer. In France, Germany, Italy, and Austria-Hungary this echelon is not under the control of divisions but is composed of medical units belonging to army corps troops.

But whatever the organization, the principle in all armies is the same, namely, to have a series of units ready to take over wounded from dressing stations and provide them with temporary shelter, food and treatment, to a more elaborate extent than is possible in a dressing station which has been shifted possibly every day, or even more frequently. The stay of wounded in dressing stations is short, from one to twelve hours, or in some circumstances longer. In any case the object should be to get them away from the dressing stations as fast as circumstances permit. In the field hospital echelon their stay is usually from one to three days or more, according to the nature of the wound, the conditions of the fighting and the resources at hand for clearing the field hospitals.

In the diagrammatic scheme the field hospitals are shown in an area behind the dressing stations, and in one alignment. In actual practice they would not all open together in fixed areas of the field, but as circumstances demanded at different times, on different days probably, and at different distances behind the fighting line. Thus hospitals opened at the commencement o the fighting might be far back at the end of it and remain for a day or two in that position; while others would come forward, occupy the positions of the dressing stations, if the fighting line advanced, and set free the dressing stations.

It is this use of the field hospital echelon that makes it necessary to keep it under the direct control of the division, and not of smaller units such as brigades. The field hospitals are, as it were, held in leash until the fighting ranks have more or less exhausted themselves for the day, they are then sent forward or opened where required. It is on this principle that most Continental armies do not even let the divisions, but only the army corps, control the movements of field hospitals. Generally after a battle lasting two or three days field hospitals will be found scattered over an area several miles in depth; those furthest back being the units opened in the earliest stages, and those furthest forward those opened at the end, or possibly too those opened early which have been already cleared and again brought up to be opened a second time. This was invariably the practice of the Japanese in the battles of Liaoyang, the Shaho and Mukden, and their method of controlling the field hospitals in this manner was of the greatest value in facilitating the removal of wounded subsequently to the lines of communication.

Stretcher-bearers are not as a rule employed in removing wounded from dressing stations to field hospitals, unless the divisional bearer

battalions are very strong in numbers. The two-company bearer battalion of the Japanese division was intended to provide one company to work between the regimental medical service and the dressing station, and the other to work between it and the field hospital. But this was found quite impossible with the numbers which had to be carried; the whole battalion was required in the first line, and the men were too tired to work subsequently in the second line.

The army which is most adequately provided with transport for this purpose is the Austro-Hungarian, for its field hospital unit has an ambulance transport column specially attached to it, and, in addition, its equipment wagons are so constructed as to act, when empty, as ambulance wagons. The Indian field hospital unit is also provided with ambulance transport to work between it and dressing stations in advance; but as a rule when large masses of wounded are collected at dressing stations their removal to field hospitals can only be achieved rapidly by impressing every available kind of transport or by waiting until the field hospitals come up to the spot where the dressing stations are opened.

The final stage in removal of the wounded in the collecting zone is that of clearing the field hospitals and bringing the wounded to rail-head or wherever the advance depots are opened.

This is the work of the echelon known now in our army, both Imperial and Indian, as the clearing hospitals. It is on the correct working of this unit that we must depend for evacuating wounded rapidly, without confusion and with the least degree of discomfort to them. As is noted in the Field Service Regulations it is the pivot on which the whole system of removing sick and wounded turns.

It has two main objects:—

(1) To take over all wounded from the field hospitals, or, in our own army where there are no field hospitals, from the field ambulances.

(2) To carefully classify wounded for further evacuation and act as a sieve, which will retain those who are either unfit for further transport or likely to be fit to rejoin their units in a comparatively short time, and prepare all others for transport down the line.

Some armies, notably the French, add other duties, such as preparation of empty railway trucks, vans and other rolling stock into improvised ambulance trains; but the two functions mentioned above are the essential duties of a clearing hospital in the system of removing wounded.

The clearing hospital takes over wounded from the field hospital echelon in front either by being pushed up to the area where field hospitals are being clogged with wounded after a battle or by opening further back, usually at the advanced depot and throwing out connecting links, such as rest stations, or refilling points, and arranging for the transport of wounded back from the field by means of locally requisi-

tioned transport, supply wagons returning empty, and any specially organized ambulance columns. This work of transport of wounded from field hospitals to rail-head in the German and Japanese armies is arranged and carried out by special units, called sick and wounded transport units, usually in the proportion of one for each division. These units are concerned solely with the work of collecting, requisitioning, preparing and bringing up all kinds of transport material to the field hospitals; taking care of wounded during the journey; forming intermediate rest stations if the journey cannot be accomplished in one day; and finally handing the wounded over to the clearing hospital, or other unit at rail-head. Ambulance columns of this nature are contemplated, I understand, in the field organization of the Indian Army. They are important and, in my opinion, indispensable links in the system of removing sick and wounded from the field.

In the British Army the clearing hospital at present is practically a converted stationary hospital of 200 beds. In the Indian Army it is in the first instance formed of the existing field hospital (ambulance) units, but there seems no reason why, if circumstances permit, a clearing hospital should not be formed of general hospitals, or sections of general hospitals, at rail-head.

In France the clearing hospital is always a special unit at rail-head, but in France and operations on the Continent generally rail-head may be regarded as never being more than a short distance away from a field of battle. We must not, therefore in consequence of continental literature on the subjects, be led into the belief that rail-head is necessarily the position of a clearing hospital.

In Germany, Austria, and Japan the units for clearing hospital purposes are chiefly of the nature of a reserve personnel, with or without material. This is specially so in Germany, where the clearing hospital unit is a unit of personnel only, which takes over a whole village or section of a town, and forms a clearing hospital out of the local resources; or, in the case of a victorious action and advance, by moving up to the spot where the field hospitals are open, by taking over such material from them as is necessary for temporary purposes, and obtaining more subsequently from local or other resources further back.

The Japanese clearing hospital system is based on the German, but a certain amount of material is carried with the personnel, who form what is called a stationary field hospital near the area where the field hospitals are opened. This is their divisional clearing hospital. Their main clearing hospital, however, is invariably formed at the head of the lines of communication by what is called "a lines of communication or stationary hospital."

The Austrian clearing hospital system is the most complete and most instructive. This is what one would expect from an army which has had so long an experience in field medical organization. It consists of a

group of three medical units, namely, a mobile reserve hospital, a mobile Convalescent depot, and a field rest station. Each army corps has two such reserve hospitals, two mobile rest stations, and three field convalescent depots. They are kept at the head of lines of communication, and are army units, ready to be sent forward to clear the field hospitals as required. These three classes of units form one or more clearing, or evacuating stations as they are called, for the two or more army corps of which the army is composed.

An evacuating or clearing station of this kind is formed as follows:—

The mobile reserve hospital, normally organized for 600 patients, receives all the wounded unfit for further transport; the convalescent depot, organized normally for 500, receives all the lightly wounded likely to recover soon, and the rest station all other wounded, namely, those fit for further evacuation down the lines of communication. A staff officer is appointed commandant of the station. He has a medical officer as his technical assistant, and has a special staff consisting of a representative of the Director of Railways, of Steamer Transport, of the Assistant Quartermaster-general Lines of Communication, and of Voluntary Aid Associations and Local Civil Authorities.

The duties of this staff are:—

(1) To receive all sick and wounded as they come in from the field, and classify them or check previous classification.

(2) To determine those who are to be retained as unfit for further transport (to be sent to the mobile reserve hospital), or as lightly wounded (to be sent to the convalescent depot), and those who are suitable for further transport (to be sent to the rest station pending entrainment).

(3) To prepare convoys of those last going down the line, and to transmit intimation of their despatch, &c.

(4) To prepare transport material, such as improvised trains and river steamer transport.

(5) To arrange for care of the patients during the journey.

(6) To prepare and complete their documents.

(7) To requisition for material to replenish expenditure.

These duties indicate generally what is meant by the clearing hospital being the pivot on which the evacuation of wounded turns. It is kept constantly ready for reception of new arrivals by a systematic flow of wounded, either down the line when fit for transport or back to their units when fit to rejoin. The first step is classification, and this system of classification into categories of wounded as regards fitness or otherwise for transport is an essential feature in the organized system of removing wounded. It should be commenced at the dressing stations, repeated at the field hospitals, and again at the clearing hospitals, because the condition of wounded may vary during the different stages. Much importance is rightly attached to this in the Field Medical Regulations of continental armies.

Once the wounded have reached rail-head their rapid evacuation to the point to which they may be distributed to permanent hospitals is simple, and depends on the number and capacity of ambulance trains, steamers, &c., which can be utilized and run regularly for the purpose from rail-head, or landing stages on rivers. The organization and preparation of transport of wounded by rail forms an interesting chapter of study in itself; so too, though to a less extent, does transport by water.

When wounded reach the base, either in the home territory or elsewhere, they should be received by a distributing station which should be organized in the same way as the evacuating or clearing station at rail-head, chiefly with a view to classifying wounded previous to despatching them to the various permanent hospitals in the home territory, arranging their routes, and so on. The Japanese had two such distributing stations, one at Hiroshima and the other at Osaka, the two ports to which sick and wounded were brought back from Manchuria. Each of these had 15,000 beds, in properly arranged hutments; the sick and wounded were classified there and those fit for further transport were distributed to the hospitals of their own divisions, at the head-quarters of each of which 10,000 hospital beds were as a rule prepared.

I have been obliged from want of time to omit many points, some of importance, such as the variation in the use of field medical units during strategical concentration, marches, advances to attack, during and after battle, in operations of defence, encounter battles, planned battles, sieges, and so on, which are dealt with in the Field Medical Regulations of some armies, although scarcely touched on in ours. They have all special features of their own affecting the medical service which are full of military and medical interest and well worthy of thought and consideration. In fact each stage in the system of removing wounded and each phase of field operations have many practical points and details worthy of study and discussion. The principles, however, which permeate the system may, I hope, be gathered from these notes; and it is only the general principles which can be illustrated in a single lecture, such as this, by the field medical organization of our own and other armies.

Echoes from the Past.

SPIDER'S WEB AND MALARIA.

By Colonel M. D. O'Connell
(*Retired Pay*).

In a volume of *Notes and Queries* for 1864 I found the following under the heading "Replies" on page 172, September 1st, '60:—

"The Medicinal Virtues of Spider's Web."

"The employment of the Tela Araucarum or spider's web, as an internal medicine in ague and other malarious diseases has considerable professional testimony in its support. Dr. Chapman, formerly one of the medical professors in the University of Philadelphia, an excellent practical physician, deservedly esteemed by the profession in America, in his 'Elements of Materia Medica and Therapeutics,' 4th Edition, 2 vols., 8vo, Philadelphia, 1825, writes of the spider's web as follows:—

"'It is an old and very general notion among the vulgar of most countries that the spider's web or the spider itself is possessed of the power of curing ague and fever, and is actually employed with this view. But, with one or two exceptions, they were rejected in regular practice, and their curative effect, if admitted at all, was imputed entirely to the strong sensations excited by so disgusting a remedy. At his last visit to this city some years ago, I was informed by *Dr. Jackson, of the British Army*, that, having largely experimented with the web, he had much reason to suppose that popular confidence in it was well founded.

"'In intermittents, he said, its powers were undisputedly ascertained, and that as an anodyne to allay pain or calm irritation, it proved vastly superior even to opiates. The web, however, had long been accredited as a remedy in these cases. It is noted in James and other old dispensatories, and was previously used by Lind and Gillespie. By one of my pupils (Dr. Broughton, of South Carolina, who made it the subject of his inaugural thesis), in whom I could place reliance, the subject was, at my request, not long afterwards investigated, and by trial on himself as well as on others he substantially confirmed the statement. In a late work by *Dr. Jackson* on fevers, I find a detailed account of his experience with the article . . . . . The web has been described by myself and several of my medical friends, particularly by Dr. Physick and Dr. Dewees,

and though different degrees of value are attached to the article, we are well satisfied that the representation of its virtues, to which I have referred, is very little, if at all, exaggerated. In doses of five grains, repeated every fourth or fifth hour, I have cured some obstinate intermittents, suspended the paroxysms of hectic, overcome morbid vigilance from excessive nervous mobility, and quieted irritation of the system from various causes, and not less as connected with protracted coughs, and other chronic pectoral affections. Among those who have used it much I find a contrariety of opinion as respects its mode of operation. While some consider it as highly stimulant, invigorating the force of the pulse, increasing the temperature of the surface and heightening excitement generally, others, witnessing no such effects, are disposed to assort it with those remedies which seem to do good chiefly by soothing the agitations of the system. I confess that I concur in the latter view of its properties. There is much difference in the web of the various species of spider. That used in this city is collected in cellars, and is probably the product of the common black spider, which is to be generally met with in such dark and damp places. I have satisfied myself that the web found in light, exposed situations, the product of the grey spider, is inert, and also the web of the others when old. The recent may be known by its glutinous feel.'—Vol. ii, pp. 202-6.

"*Dr. Jackson*, in the work referred to by Dr. Chapman, expresses his belief that spider's web prevents the recurrence of febrile paroxysms more abruptly and more effectually than *bark, arsenic or any other remedy* with which he was acquainted. If given during the intermission, 'the return of the paroxysm,' says he, 'was prevented—if given under the first symptoms of a commencing paroxysm the symptoms were suppressed, and the course of the paroxysm was so much interrupted that the disease for the most part lost its characteristic symptoms. If it was not given until the paroxysm was advanced in progress, the symptoms of irritation, viz., tremors, startings, spasms and deliriums—if such existed as forms of febrile action—were usually reduced in violence, sometimes entirely removed. In this case sleep, calm and refreshing, usually followed the sudden and perfect removal of pain and irritation.'

"Finsbury Place. "W. Munk, M.D."

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Under a notice of "Amulets" in the Encyclopædia Metropolitana I find the following extract from the Diary of Elias Ashmole:—

"I took early in the morning a good dose of elixir, and hung three spiders about my neck, and they drove my ague away, *Deo gratias!*"

"Spiders and their webs," says Pettigrew, "have often been recommended for the cure of this malady."

Burton gives the following:—

"Being in the country, in the vacation time, not many years since, at Lindly, in Leicestershire, my father's house, I first observed this amulet of a spider in a nutshell wrapped in silk so applied for an ague by my mother. I could see no warrant for it. '*Quid aranea cum febre?*' For what antipathy? Till at length rambling amongst authors (as I often do) I found this very medicine in Dioscorides, approved by Matthiolus, repeated by Aldrovandus, *Cap. de Aranea, lib. de Insectis.*"—*Ibid.*

F. Phillott.

Although the above curious use of spider's web is not now recommended as an internal remedy for ague, its external use for the domestic destruction of mosquitoes, and consequent prevention of malaria, is sadly neglected. Cobwebs are ruthlessly swept from dwelling houses. And yet I have often, in India, seen the cobwebs in my bath-room laden with the remains, in the form of wings and legs of the dead mosquito, done to death by the harmless necessary spider in the interest of mankind.

TITLE OF PRINCIPAL MEDICAL OFFICER.

By Lieutenant-Colonel C. BIRT.

Royal Army Medical Corps.

In the number of the Journal of the Royal Army Medical Corps for September last, Colonel A. Peterkin tells us the origin of the title "Principal Medical Officer." It may interest our readers to ascertain from contemporary history how the term was received.

In a rare work headed "Analytical View of the Medical Department of the British Army, by Charles Maclean, M.D., Lecturer on the Diseases of Hot Climates, London, 1810," the author writes:—

"Nothing can be a more complete exemplification of the artifices resorted to by the Medical Board, in order to perfect the facility of

jobbing, than the appointment of that *lusus naturæ,* which they have called a Principal Medical Officer (a pretty Jesuitical term) whom the Surgeon-General recommends; for the warrant of Principal Medical Officer confers on the officer to whom it is given, whatever be his rank or length of service, a local rank superior even to the Inspector. An Assistant Surgeon, or a Hospital Mate, without one grain of sense or experience, might, at the whim of Mr. Keate, or the influence of a favourite, be put in a position to command Physicians and Inspectors of sense, experience, and education. What an admirable system! What encouragement to Gentlemen of talents and liberal education to enter into and continue in the Service! To exemplify these cases—we find Mr. North, village Apothecary and Man-midwife at Chelsea, and actually Deputy to Mr. Graham, Apothecary to Chelsea Hospital, Principal Medical Officer at the York Hospital, Chelsea, having a Fellow of the College of Physicians under his command!! . . . At Bury St. Edmonds in 1803, and at Plymouth in 1806, Purveyors were Principal Medical Officers, commanding Physicians and Staff Surgeons!!! At Gosport, at Deal, at Dunmow, Staff Surgeons were Principal Medical Officers, commanding Physicians! For this strange officer, the Physician- and Surgeon-General appear long to have been unable to find an appropriate name. He was first called 'Superintendent,' then the 'Senior,' then the 'Head,' and ultimately 'Principal Medical Officer.' They took this droll fellow indiscriminately, they say, from Physicians, Surgeons, Apothecaries, or even Hospital Mates, if found to answer the purpose."

He inveighs against the Medical Board and all their doings.

"The Board consists of three members, a Physician-General, a Surgeon-General, and an Inspector-General of Army Hospitals. Every man of common powers of understanding would conclude that some small portion of experience and practical observation, in camps, and in hot climates, might be necessary to enable these general officers to discharge, with judgment and success, the important duties of their situations:—duties, on the faithful and enlightened performance of which may depend not only the fate of armies, but eventually the fate of empires. But how, without supposing supernatural talents, can such knowledge be acquired in the common routine of hospital practice in London, where the diseases most incidental to armies seldom, if ever, occur?

"Let us try the individual merits of the present occupiers. Sir Lucas Pepys" (he was President of the Royal College of Physic-

ians, and Chairman of the National Vaccine Institute), "Physician-General, and presiding Member of the Medical Board, if ever he has been beyond the bills of mortality, or the watering places, is well known never to have been in foreign climates, or to have served in any medical capacity in the army, previous to his having obtained the highest rank in this Department. In proof of that let us hear Sir Lucas himself in his answers to the queries of the Commissioners of Military Enquiry.

"*Q.* What acquaintness had you with Army medical practice previous to your appointment to be Physician-General to the Army in January, 1794?

"*A.* None.

"*Q.* What acquaintance have you had since your appointment with Army Hospital practice?

"*A.* None personally.

"Mr. Keate, Surgeon-General and second Member of the Medical Board, must have acquired his experience of the necessities of armies in foreign climates, from the limited scene of casualties which may have occurred in the regular routine of parades at the Horse Guards, or occasional field days and reviews in Hyde Park and Wimbledon Common.

"Mr. Knight, Inspector-General of Army Hospitals and third Member of the Medical Board, in respect to foreign travel, may be said to have some little advantage over Mr. Keate, having once crossed the Channel in the family of the Commander in Chief, in the ever memorable expedition to Holland. . . .

"So completely have they considered themselves as having an absolute right to direct promotion at pleasure, that not an individual has been known to be promoted in the course of seniority, even by chance. If this is a mistake, they have the means of refutation in their own hands. Let them publish a list of the Medical Department (a thing which has never been done) with the dates of the respective appointments and promotions. . . . Accordingly we find that while there may be Hospital Mates (the lowest degree of medical rank) of thirty years standing in the army (Brown in America), a great part of the time, perhaps, serving in hot climates, there may be Inspectors of Hospitals (the next in rank to the Medical Board) of only a few years standing, who have never known the hardships of a single compaign (Mr. R. Keate, nephew of the Surgeon-General, and Somerville, promoted from Hospital Mate to Deputy Inspector of Hospitals and made Principal Medical Officer, Canada, when he had six years' service)."

Concerning the education of Hospital Mates, he refers to one who was appointed at the age of 16, after a four months' apprenticeship. In 1804 they were given commissions, but it was not until 1809 that they were gazetted, for our author says of them: "Lately, for the first time, I have observed that Hospital Mates were put upon the footing of gentlemen, and their appointments inserted in the *Gazette*."

A glance at the table of contents of this remarkably outspoken book gives us an estimate of its character.

"Ignorance and inexperience of Medical Board demonstrated.

"Intrigues against the other two Members in favour of Mr. Knight.

"Description of the *lusus naturæ* introduced by Mr. Keate into the Service under the title of Principal Medical Officer.

"Criminal expenditure of the Medical Department of the Army.

"Extraordinary unchecked charges of the Apothecary-General.

"Proof of Mr. Keates receiving presents from Medical Officers.

"Scarcity of medicines in the expedition to Walcheren. Only 1,000 beds provided for 7,000 to 9,000 sick.

"General misconduct of Medical Board."

In a footnote he adds: "A complaisant conflagration happened in the Army Medical Board Office in the year 1803, when many criminal as well as some innocent vouchers are reported to have perished in the flames."

Though we read his diatribes with pain, they throw a light upon military medical organization at that time.

Reviews.

SERVICE MEMORIES. By Surgeon-General Sir A. D. Home, V.C., K.C.B. Edited by Colonel C. H. Melville, R.A.M.C. London: Edward Arnold. 1912. Pp. vii. and 340. Price 12s. 6d. net.

These reminiscences were written by Sir Anthony Home, at the instance of his old friend and brother officer, Lieutenant-Colonel Craig. It was felt by the latter, and by many others, that the records of so distinguished a career should not be allowed to remain merely in manuscript form. But it required much pressure before Sir Anthony reluctantly gave his consent to their publication. As Lieutenant-Colonel Craig felt himself unable to undertake the labour of preparing the manuscript for the press, he entrusted it to the Director-General, Army Medical Service, with the suggestion that some officer of the Corps might carry it through, on the understanding that any profits which might arise

from the sale of the book should be devoted to some charitable fund in connection with the Royal Army Medical Corps. This duty has been most successfully carried out by Colonel Melville, who dismisses the labour thereby entailed with the remark that he has considered it best to add as little as possible to the original story, and that he has, therefore, only given in a few short notes the leading steps in Sir Anthony's official career during the intervals between the various campaigns here recorded. No attempt has been made to turn them into a complete life of the author, which it is evident would have been the last thing to be desired by him. The keynote of the book is suppression of self. Nothing could exceed the simplicity with which are described details of the great events in which the author took no mean part. A special interest attaches to his vivid description of the little incidents of everyday life in barracks, when travelling and on service, which are passed over by the more formal historian. Thus, on joining his first station, George Town, Demerara, in 1848, he records how a custom, once universal, and which had even then fallen into disuse nearly everywhere, still survived at that station. Every morning at gun-fire, instead of the ordinary *réveillé* on a single bugle, the whole of the drums marched from the men's barracks to the officers' quarters and back playing "A Point of War." He remarks that he has no recollection of having seen a soldier suffer from sunstroke in the whole course of his West Indian service, which agrees with the experience of many of us who have served in those pleasant stations since.

In Trinidad he served with the Connaught Rangers, and notes the surprise it was to him to find how little Lever had exaggerated his portraits of the Irish soldier.

In 1854 he joined the 8th Light Dragoons in the Crimea, later on being promoted into the 13th. He was a witness of the retirement of the Light Brigade, and says that their escape from even heavier loss was largely due to the demonstration made by the French cavalry, which arrested the advance of the Cossacks in pursuit. His pictures of everyday life in the Crimea are of great interest, and through his eyes one sees it in its spring as well as its winter garb.

The intercourse between the soldiers of France and England did not extend much beyond the greeting "Bono Johnny!" "Bono Francey!" and in the case of the officers, ignorance of one another's language was almost as general. Home was much impressed with the appearance of the Sardinian troops, 10,000 strong, who afterwards took an important share in the battle of the Tchernaya. Towards the end of the war, being stationed at Scutari, he had the unusual experience of serving in the French hospitals at Galata. Owing to the terrible outbreak of typhus, by which the French lost 10,000 men, and to which no less than fifty-eight of their surgeons succumbed, they requested the services of twelve British medical officers, of whom Home, having acquired some knowledge of French during his studies in Paris, was one.

In the spring of 1857, having transferred to the 90th Foot, Surgeon Home embarked with the expeditionary force for China; but his ship was one of those which were turned back in the Sunda Straits on the outbreak of the Mutiny. Arriving at Calcutta he proceeded by boat to Allahabad, and took part in Havelock's march to Lucknow. It was on the occasion of the latter forcing his way into the Presidency that Home

won the Victoria Cross. It is left to the editor to record in an appendix this act of gallantry, by which Home for twenty-two hours kept the enemy at bay and saved the remnant of his doolie column. He shared in all the subsequent fighting of the Oudh Field Force, and after the relief of Lucknow was invalided home.

After little more than a year at home, Home, now a Staff Surgeon, was again on his way to China with Sir Hope Grant's force. He was appointed to the personal staff of the General, and later on was transferred as medical officer to Lord Elgin's Embassy. Of the opportunities thus afforded him he made full use, and gives a most interesting account of the campaign and of the city of Pekin. On the completion of the mission he returned home with Lord Elgin, visiting Manilla and Batavia on the way, seeing, as was his custom, all there was to be seen, and recording his impressions in simple and vivid style.

The next chapter of his varied service is headed "Incidental to a Great Crisis—Canada (1861)." As a result of the often forgotten "Trent affair" we were on the verge of war with the United States, and Home was one of a party of special service officers sent out in December, 1861, to arrange for the transport and accommodation of the 5,000 or 6,000 men expected from England, who, landing at Halifax, were to be conveyed by sleighs 500 miles, through Nova Scotia and New Brunswick, to the railway terminus at Rivière du Loup, and thence by rail to Montreal. This route was necessitated by the winter closure to navigation of the St. Lawrence. Traversing the country close to the border of Maine, he describes the passionate loyalty of the people of New Brunswick, who scouted all consideration of the consequences of war. When the danger of this had passed he obtained leave to visit Washington and the army of the Potomac, and gives a graphic account of Washington during the war.

On one occasion at breakfast he was seated next General Scott, "the greatest non-official person in the States," the invocation of whose name, preceded by the appellative of "great," has spread from the New World to the Old.

Home's last service recorded in these memories was in the New Zealand War of 1864, for which he received the C.B. and was specially promoted Staff Surgeon-Major.

Colonel Melville describes shortly the remaining episodes of Home's career until his retirement, at the age of 60, in 1886. Of these the principal was the Ashanti War of 1873-74, for the medical organization of which he was accorded high praise by Sir Garnet Wolseley, and received the Knight Commandership of the Bath. On this point the editor remarks: "There is no doubt that the striking success, from a purely sanitary point of view (which in a tropical campaign means also a military point of view), of this expedition, in a climate which had proved so fatal to all other attempts to invade Ashanti, was very largely, if not wholly, due to the forethought and exertions of the Principal Medical Officer."

From internal evidence it would appear that these reminiscences were not put on paper till within the last ten or twelve years, yet the description, by a keen observer of events reaching back for more than half a century, is as vivid as if written at the time. This most modest record of a highly distinguished career has resulted in a book of the greatest interest, which should be read by all of us.

J. T. C.

LEITFADEN DER PRAKTISCHEN KRIEGSCHIRURGIE (Surgery in the Field). By Dr. W. v. Oettingen. Dresden and Leipzig: Theodor Steinkopff, 1912. Pp. xvi and 377. Price 9s. 6d.

Surgical practice in the field must be conducted on different lines to that at home. Difficult operations and complicated methods of procedure are out of the question; everything must be cut down to its simplest form. In fact, everything resolves itself not into doing what is abstractly best for the patient, but what is best under the circumstances. To distinguish the possible from the impossible is almost entirely a matter of experience. This experience, which he gained in the Russo-Japanese War, the author now puts at our disposal. Written primarily for civilians who upon mobilization are called upon to take upon themselves the duty of Army surgeons, it contains much that is of value also to the Regular officer. One drawback is unavoidable. A large number of the author's suggestions for the sterilization of the skin, the fixation of dressings, &c., depend upon the use of mastisol, a resinous preparation invented by himself. As the British Army is not supplied with this, these suggestions are, of course, for us impracticable. But enough remains to make the book well repay perusal.

The first part of the book is of a general nature. Preliminary chapters on the mechanism of projectiles and the general effects of bullet wounds do not call for much remark. The chapter on infection is interesting. The author's views may be summarized as follows. The healthy body can deal with a large number of bacteria. Inflammatory œdema by its pressure lowers the vitality of the tissues, and thus prepares the way for the spread of infection. Aseptic methods aim at reducing this pressure by absorbent dressings. They are, therefore, preferable to antiseptic ones which aim only at killing the bacteria, often at the expense of lowering the vitality of the tissues. Only such antiseptics as are innocuous to the tissues are thus permissible. This puts most antiseptics, especially corrosive sublimate, out of court. In fact, the only one v. Oettingen has a good word for is Credé's collargol. It is rather a shock to learn his poor opinion of iodine. He states that bacteria have been recovered from the deeper layers of the skin at the conclusion of an operation when most of the iodine had been washed away, and ascribes most of the good results of modern surgery to the improved technique of the surgeon.

No words can be too strong to express the author's condemnation of the practice of probing a bullet wound. He expresses his approval of the Austrian Regulations which expressly forbid it, with the hope of the necessary corollary to follow that it should be a punishable offence. Dressings also should not be changed unnecessarily. A first field dressing should only be removed for three reasons: if it contains a "poisonous" gauze, if it has shifted, and if it is blood-soaked. A dressing should not be taken off every time there is a rise of temperature; the rise may be only due to the absorption of disorganized blood products. There are only two exceptions to the general rule of leaving dressings on as long as possible; wounds of the head, and temporary dressings for severe hæmorrhage. All amputations should be carried out on the simplest possible lines. If amputating to remove a focus of infection in septicæmia, go through everything in the same plane; the first indication is to save the patient's life, the stump can be improved afterwards.

In discussing the evacuation of the sick, v. Oettingen adopts Port's principle of shifting the patient as little as possible; in fact, he would if at all feasible let the patient remain on the same bed from front to base. This is the idea of his "stretcher bed," which combining the qualities of both enables this idea to be carried out. The stretcher part simply consists of two long poles and a double fold of canvas which can, if necessary, be stuffed with straw. This can be turned into a bed by the simple expedient of adding head and foot pieces, and of raising the stretcher from the ground by short poles which form the feet of the bed (p. 166). Maguet's suggestion that every stretcher shculd be provided with four short "feet" may be mentioned here. On p. 178 a useful table is given of the injuries which in the author's experience do not require hand carriage from the battlefield. Other useful remarks are on the transport of abdominal injuries by rail. The author would, if possible, let fourteen days elapse before attempting it.

The last part of the book deals with specific injuries and their treatment. As regards the latter it is divided into three stages: treatment at the Truppenverbandplatz (Regimental Dressing Station); at the Hauptverbandplatz (Divisional Dressing Station); and at the Feldlazarett (Field Hospital). This is an excellent arrangement and one which meets a long-felt want. In the field it is not so much the question of what should be done, but what can be done under the circumstances, and here Oettingen gives most valuable guides. It is true that English readers suffer from the disadvantage that our advanced dressing stations and clearing hospitals do not more than approximately correspond to the German terms; still with a little adaptation this is not a serious detraction. In fact, the whole book needs for English readers adaptation ss well as translation. With this done it should be of the greatest value.

J. A. B.

Sahli's Tuberculin Treatment. (Translated from the Third German Edition. By W. B. Christopherson.) Bale, Sons and Danielsson, Ltd. 1912. Pp. viii and 198. Price 7s. 6d net.

This book deserves to be widely read and carefully considered by all who propose to use tuberculin in treatment as it supplies that invaluable asset, a definite hypothetical basis on which to found practice, in addition to clear and useful advice as to the application of the theory which is advocated by the author. A point of fundamental importance is that all tuberculins are essentially the same and consist of the body-substance of the tubercle bacillus. It was Wolff-Eisner who first suggested that tuberculin as such does not possess toxic properties, but that when altered by the action of a specific lysin it acquires a high degree of toxicity. This view renders intelligible the remarkable fact that healthy guinea-pigs, although so susceptible to tuberculosis, tolerate a dose of 1 to 2 grm. of Koch's old tuberculin without injury, and that, while persons never exposed to contact with tubercle bacilli fail to react to the cutaneous tuberculin test, a very dilute tuberculin solution evokes a marked local response in persons with even slight tubercular foci in their tissues. Wolff-Eisner's theory receives further support from the discoveries of Wassermann and Bruck, who have demonstrated the presence of an antibody in the blood of persons suffering from tuberculosis.

Accepting this theory as the basis of his tuberculin therapy, Sahli

demands three essentials for a tuberculin preparation: (1) That it should be capable of accurate standardization; (2) that it should be as far as possible free from non-specific toxins; and (3) that it should be available for general use in dilutions that permit of a wide range of selection and a very gradual increase of dose. These are fulfilled by tuberculin Beraneck, which is essentially a mixture of a peptone-free tubercle broth filtered free from bacilli and evaporated down *in vacuo* at a low temperature, with an extract of the bodies of tubercle bacilli made with orthophosphoric acid and containing, therefore, the bacillary protein in the form of an acid orthophosphate of albumin. The concentrated fluid thus obtained is diluted 62·5 times to form solution H, the strongest "tuberculin Beraneck" supplied for use. It is obtainable in fifteen dilutions, these being in multiples of 2, so that, from the weakest upwards, each is twice as strong as the last. The weakest solution is therefore 1/16384 of solution H; but where still more dilute preparations are required for the treatment of specially sensitive patients, these can be obtained without trouble from the manufacturers. These fine graduations of dilution are, in the opinion of Sahli, a decided advantage over those of Deny's tuberculin, which is supplied in eight dilutions increasing in tenths. In criticism of the latter he says: "Let us suppose that the practitioner is using an ordinary 1 c.c. syringe graduated in tenths, that he is employing one of the weaker solutions, and has gradually risen, division by division ($\frac{1}{10}$) to a whole syringeful. He then proceeds to the next dilution, of which one division of the syringe is equivalent to the whole syringeful of the previous dilution. If he now proceeds as before using two divisions of this new solution, it is clear that the dose will be doubled. One cannot wonder that sudden sharp reactions often take place." Sahli a' vocates the avoidance of clinically appreciable reactions, and is against practitioners making the dilutions themselves, as this procedure, to be accurate, requires standard appliances and special skill.

The book is a most valuable contribution to the subject, and should go far to clear up the confused thinking which militates against the efficiency of tuberculin therapy in this and other countries. The translation is so good that the English edition reads like a well-written original. S. L. C.

ARTHRITIS: A STUDY OF THE INFLAMMATORY DISEASES OF JOINTS. By Peter Daniel, F.R.C.S. Bale, Sons and Danielsson, Ltd. 1911. Pp. 515 + viii. Price 12s. 6d. net.

This is a book of over 500 pages, neatly bound and full of information in a readable and compact form. Without wasting much space with non-essentials, the author gives us here a most masterly description of the various diseases to be met with in different joints, and takes for granted that the reader has some previous knowledge of the subject. In describing cases involving difficulty, or where a doubt as to a diagnosis may exist, the differential diagnosis of simulating conditions is clearly discussed in parallel columns.

A chapter is devoted to the condition known as internal derangement of the knee-joint, and the diagnosis of this complex phenomenon is clearly discussed. That this condition is often caused by osteo-arthritic changes in the joint is wisely emphasized.

A good account is given of tubercular disease of joints, while spinal

caries is thoroughly discussed, and excellent illustrations of the various apparatus suitable for the treatment of these diseases are given. Several diagrams of diseased joints are reproduced, and the many illustrations, often diagrammatic, will be found of much aid in the study and elucidation of the morbid processes in joints. The various treatments of joint disease are clearly laid down, and in this connexion the use of hyperæmia induced by one or other of Bier's methods is well and duly emphasized. The book ends with an excellent account of Bier's methods, and the fact that these methods to be used successfully should be used intelligently is strongly enunciated.

By practitioners or students preparing for examination this book will be read with both pleasure and profit. J. W. H. H.

ANÆSTHETICS: A PRACTICAL HANDBOOK. By J. Blumfield, M.D. London: Baillière, Tindall and Cox. 1912. Pp. vii. and 134. Price 3s. 6d. net.

This little book of some 120 pages is an attempt to give the student a brief account of the principles upon which the commoner anæsthetics are selected and administered, and of the practical details involved.

There are excellent chapters on the means of administering nitrous oxide, ether, chloroform, and ethyl chloride, while the choice of an anæsthetic and the dangers and troubles incidental to anæsthesia are also well discussed. In his description of the action of these drugs the author shows considerable skill and knowledge of his subject.

But the subject of anæsthetics to-day is happily not limited by a consideration of these four drugs, nor to the methods of inhalation anæsthesia here described. There are other ways of inducing anæsthesia than by these old-fashioned and primitive methods.

No mention has been made of hedonal nor the induction of anæsthesia by scopolamine and morphia.

Ether intravenously has been accorded a very brief reference, while the chapter on spinal and local analgesia is, in the light of modern knowledge, not only inaccurate, but positively misleading.

These newer methods now have their established positions as handmaids to surgery, and in several clinics have almost ousted inhalation anæsthesia, so that it appears illiberal to grudge them their due recognition in a treatise on anæsthetics.

Pace these omissions, we are here given an excellent account of the drugs suitable for inhalation anæsthesia, and the student will find in this little book much information which was in vogue amongst anæsthetists during the past decade. J. W. H. H.

HINTS TO YOUNG SOLDIERS OF THE ROYAL ARMY MEDICAL CORPS (TERRITORIAL FORCE). By Captain C. R. Sylvester-Bradley, R.A.M.C., Adjutant R.A.M.C. (T.F.), School of Instruction, Wessex Division. Pp. 16, $2\frac{1}{2}$ in. $\times$ 4 in. Gale and Polden. Price 2d.

This is a handy little notebook containing hints and directions on general behaviour, dress, examinations for promotion, &c., which have been extracted from official textbooks and regulations. Mess-tins should have been included under "Marching Order." We can recommend its purchase by men enlisting in the Royal Army Medical Corps (Territorial Force) who would naturally find it difficult to hunt up this information for themselves. C. E. P.

Current Literature.

Military Absenteeism in War, with Special Reference to the Relation of the Medical Department thereto.—Under this heading, Major Munson, Medical Corps, U.S.A., has contributed an article (*Military Surgeon*, May, June, July, 1912) showing the enormous extent to which an army in the field may become depleted, partly as the result of men being unnecessarily admitted to hospital, given sick furloughs, or discharged as invalids on insufficient medical grounds.

The following figures, showing the number of men absent from the Federal armies from all causes, were taken from the Report of the Provost Marshal-General of the Union Forces, compiled after the conclusion of the Civil War:—

Date	Total strength present	Total absent from all causes
Jan. 1, 1861	14,663	1,704
July 1, 1861	183,588	3,163
Jan. 1, 1862	527,204	48,713
Mar. 31, 1862	533,984	103,142
Jan. 1, 1863	698,802	219,389
,, 1, 1864	611,250	249,487
,, 1, 1865	620,924	338,536
Mar. 31, 1865	657,747	322,339

Thus, one year after the beginning of the war one union soldier was absent for about every five present, a year later one man was absent for every three present, and in the final year of the war more than one-third of the establishment was absent.

To check this appalling amount of absenteeism, stringent orders were published by the military authorities, but in most cases these were disregarded. The Confederate Forces suffered in a similar way from absenteeism.

In discussing the causes which led men to absent themselves from the army, Munson thinks that dislike of the service in the army, which in many cases they had been forced to take up, also want of discipline and political influences were the main factors. In most instances the withdrawal of the men from the army was effected by the agency of civil hospitals established by the various States, the authorities of which claimed that sick or wounded soldiers should be sent back to their own State hospitals for treatment. To ensure that this was carried out, many of the States appointed agents to accompany the State regiments for the sole purpose of seeing that all sick and wounded were sent back to their own State hospitals, which were independent of all military control. Once there it was next to impossible to get the man back to the army. The State politicians used their influence to get the man a sick furlough to his home, so that he might vote for them at the elections. From his home medical certificates were sent to the military authorities, who, being unable to verify the worth of these, had to accept them as sufficient excuse for absence.

At the beginning of the war there were only 181 medical officers of the regular army, while during the course of the war 14,000 civilian medical men were employed in different capacities. The civilian doctors had little or no experience of army work, and readily admitted men to hospital

or granted furlough on medical certificate without realizing the effect of their action on the effective strength of the army. Attempts were made to check the abuse by having medical certificates attested by a civil magistrate. Sentimentalists with humanitarian ideas also exerted considerable influence in the granting of sick furloughs. Bribery was even resorted to by friends of soldiers in order to obtain certificates of disability. In consequence of the wholesale delegation of the authority to grant certificates of discharge for disability, they were easily obtainable, and General Upton says that in the year 1862, 100,000 men were discharged for this cause from the army; this had the further result of producing an enormous pension list.

During the war with Spain in 1898, absenteeism again caused trouble. Any surgeon in charge of a general hospital was authorized to give a sick furlough. Later, under pressure from the Press, divisional and regimental commanders were authorized to grant sick furlough on the recommendation of a medical officer. Many of the men who obtained this privilege simply disappeared after their return to their homes.

During the Civil War the total number of men discharged on "surgeon's certificate of disability" was 223,525. Other causes of loss, as given in the Provost Marshal-General's Report of March 17, 1866, were; Died of wounds, 34,773; died of disease, 183,217; deserted, 199,045; killed in action, 61,362.

Munson points out that most of the trouble was due to the wholesale employment of medical officers who had no knowledge of military requirements, and could not appreciate the difference between treating civilians and soldiers. He shows that any skilled medical man can treat disease, but that something more than this is required of the medical officer who first sees a soldier when reporting sick. It is then that shrewdness and experience are necessary to discriminate between diseases which are of importance from an army point of view, minor ailments which need not be treated in a hospital, and malingerers who deserve punishment. C. E. P.

Changes in the Prussian Army Medical Service during 1911.—Stabsarzt Dr. Georg Schmidt (*Berlin. klin. Woch.*, No. 28, 1912) has contributed a lengthy review of the principal changes which have taken place during the year 1911 in the Prussian, Saxon, and Wurtemberg armies. Many of these have already been noted in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS.

(1) *Field Medical Service and Equipment.*—New editions were issued of the following regulations which affect the medical services:—

"Anhang zur Dienstanweisung für Bagagen, Munitionskolonnen und Trains."

"Feldpionierdienst aller Waffen." This deals with: Dressing stations in siege trenches, the supply of drinking water, disposal of sullage, latrines, &c., in camps.

At the manœuvres of one army corps, ambulance dogs, which had been trained by a private society to search for wounded, were tested. The results were as unsatisfactory as on many similar trials previously held.

The advanced depot of medical stores now has attached to it six motor ambulance wagons and six light motor lorries, which can also be used for the transport of wounded.

Wheeled kitchens are being provided for bearer companies, as also Röntgen-ray wagons for the L. of C. depots of medical stores. A second first field dressing for every man in the army is also being provided.

A large number of new splints, tabloids, &c., and also von Oettingen's "mastisol" dressing were tested during the year. Silver suture wire has been replaced by aluminium bronze wire.

(2) *Medical Service in Peace.*—A new grade, that of "Obergeneralarzt," has been introduced for the "Sanitätsinspekteure"; they have the relative rank and allowances of a brigade commander.

The number of students at the Kaiser Wilhelm Akademie (Army Medical College) is steadily increasing. New regulations for candidates for admission to the army medical service were recently issued.

The following additional appointments were created during the year: 1, "Oberstabsarzt" in the dismounted artillery; 2, "Stabsarzte," and 3, "Oberarzte" in the transport service.

In six army corps the number of "Militärkrankenwärter" was increased. In addition to the sisters belonging to religious orders there are seventy-two army sisters employed in the garrison hospitals.

(3) *Hospitals and Equipment in Peace Time.*—In the new dress regulations, a "hospital coat" made of light washable material has been introduced for medical officers doing duty in the wards or laboratories.

A number of new hospitals and extensions of existing hospitals have been completed or begun during the year.

The new barrack regulations have abolished the term "Revierkrankenstube" and replaced it by the term "Kasernenkrankenstube." This ward will in future be provided with a room for seeing patients, a hall and a separate latrine. Medical officers' quarters in barracks are to be provided with a room for saddlery.

A number of alterations have been introduced tending to simplification in the interior economy of hospitals and the rendering of reports.

In order to obtain a sufficient number of trained mental attendants, parties of N.C.O.'s of the medical corps have been detailed in turn for a course of instruction in the special army mental hospitals. Others have been detailed for duty in the army medical stores to learn the management of medical depots.

(4) *Hygiene.*—The resolutions of the "Bundesrat" and Imperial Chancellor directing the police and military authorities to inform each other in the event of an outbreak of infectious disease have been promulgated in the army. C. E. P.

Barrack and Hospital Spittoons.—Méd. Major Romary (*Le Caducée*, July 6, 1912), after enumerating the substances usually employed as absorbents in barrack spittoons and the objections to each of these, suggests that coffee grounds form an ideal substance for the purpose. He shows that 1,000 men in barracks use 5 kilos. of coffee a day, the grounds of which have a bulk of 24 litres. A litre of coffee grounds dried by exposure to the air weighs 455 grm., and can absorb its own weight of moisture. A small quantity should be placed in the spittoon, and once or twice during the day a fresh layer should be sprinkled on the top; when full the contents should be burnt. C. E. P.

Camphorated Oil in Abdominal Surgery.—Méd. Major Lahaussois *Archiv. de Méd. et Pharm. militaires* No. 7, 1912) contributed a lengthy review of the literature on this subject, together with some of his own

experiences. His general conclusions are that in cases of septic peritonitis, following an operation, camphorated oil injected intraperitoneally tends to lower the pulse and respiration rate and to improve the general condition of the patient. It is quite innocuous. In preparing the camphorated oil, the oil should first be extracted with alcohol, the camphor is then dissolved in it and the oil sterilized in the autoclave. The usual proportion of camphor is 1 per cent, although strengths of 5 per cent and of 10 per cent have been employed. From 100 to 300 grm. have been injected at a single sitting by different authors. As the action is largely a mechanical one due to the oil, small quantities are of little use. The actual quantity of camphor injected at one time is usually from 1 to 3 grm., although 15 grm. have been used without any bad result. The injection may be repeated daily through the drainage tube. Intraperitoneal injections of camphorated oil prevent the formation of adhesions and act as a powerful stimulant, thus forming a valuable auxiliary to other means of post-operative treatment in cases of septic peritonitis. C. E. P.

Wound by Blank Cartridge.—Galzin and Chevron (*Archiv. de Méd. et Pharm. militaires*, No. 6, 1912) report an interesting case of suicide by blank cartridge. The soldier was on guard in a magazine and was found dead, with a recently discharged carbine lying by his side. At the level of the sixth left intercostal space and close to the border of the sternum there was a rounded wound of entrance measuring about 1·5 cm. in diameter. The surrounding skin was scorched. There was no other external lesion. At the autopsy the cartilage of the sixth rib was found to be broken; the left lung pushed aside, the pericardium torn with a little blood in its lower portion, and the left ventricle torn open. No traces of any wadding could be found, and the authors suggest that the injuries might have been inflicted by the escaping gases. C. E. P.

Health of the French Army.—Owing to some references to German army medical statistics made by a member of the French Senate during a debate on the health of the French army, Professor Schwiening has compiled (*Deutsch. med. Woch.*, No. 25, 1912) a short comparative analysis of some of the statistics for both armies.

Taking tuberculosis in the two armies, Schwiening quotes the official reports to show that in 1890 the admissions per 1,000 of strength were for France 5·2, and for Germany 3·3. Up to the year 1897, France showed an almost continuous increase, the ratio being in that year 7·3, while German figures showed a continued decrease, the ratio in 1897-98 being only 1·9 per 1,000 of strength. Since 1897, France has in some years shown a slight reduction, but in 1908 the ratio was 7·7, and in 1909, 6·8. The German figures have remained almost constant, being still 1·9 in 1909-10. If the figures for tubercle of lung only are taken, the ratio of admissions in France was 5·1 in 1890, and 4·7 in 1909, the corresponding figures for Prussia being 2·9, and 1·4. These show that for this form of tubercle there has been some improvement in the French army, while the incidence in the German one has fallen to less than half. The improvement in the French figures is more apparent than real, as a number of tubercular soldiers are invalided without having been previously admitted to hospital. The invaliding and deaths on account of tubercle of the lung added together, gave a ratio per 1,000 of strength in France, of 5·5 in 1900, and 7·2 in 1909, the corresponding figures for

Prussia being 1·5 and 1·2. The loss from these causes has constantly increased in the French army, and steadily decreased in the German army. The above figures for the French army do not include men invalided under "suspicion of tubercle," general debility, chronic bronchitis and pleurisy. If these are added to the figures quoted above we find that the combined loss from all these causes per 1,000 of strength was 12·3 in 1900, and 17·9 in 1909. Schwiening does not claim that all the disability in the four groups is due to tubercle, but that these disabilities certainly suggest either early tubercle or a predisposition towards infection. The corresponding figures for the German army can only be given from 1904-05, when the ratio of loss from all the above causes (except "suspicion of tubercle," which term is not employed in the German reports) was 7·0; in 1909-10 it was 5·5.

A further analysis of the French figures shows that the number of men invalided for tubercle in their first year of service is twice as great as those in other years of service, which may be taken to mean that the majority of these men become infected in civil life before entering the army. In the German army men in the first year of service furnish about one-third more invalids for tubercle than men in other years of service, although the total incidence is only about one-sixth of that in the French army.

The inference which one naturally draws from the above figures is that many men among the annual contingent of recruits for the French army are not really physically fit to serve. The fact that they are passed as fit is not the fault of the examining medical officers, but is due to the actual shortage in the number of men liable for service which forces the medical officers to accept a very low standard of physical fitness. This is further supported by the fact, that of the men liable for service and whose physical fitness was finally decided, only 1·6 per cent were rejected on account of physical debility, whereas, during the same period in the German contingent 9·5 per cent were rejected for this cause. C. E. P.

Medical Arrangements of the French Expeditionary Force to Fez, Morocco.—In the "Chambre des Députés" during the séance of June 14, 1912, M. Lachaud drew attention to the faulty medical arrangements during the expedition for the relief of Fez. He complained especially of the serious losses due to typhoid fever and dysentery, which he maintained might have been obviated had the recommendations of the medical authorities been attended to. M. Lachaud stated that from a medical point of view the results of the Fez expedition were nearly as bad as those of the Madagascar expedition, and gave the following figures :—

EXPEDITION TO FEZ, 1911.

	Killed in action	Wounded	Died of disease
Officers	5	9	16
Troops of Home Army	19	21	269
,, Colonial Army	8	47	235
Tunisian and Algerian Native troops	8	28	80
Senegalese Native troops	..	8	29[1]
Total	40	113	629

[1] Mainly from pneumonia.

About 4,000 were invalided to France.

The expeditionary force of roughly 25,000 men has thus lost nearly 5,000 men in eight months.

M. Lachaud then went on to make detailed statements in regard to the insufficiency of hospital accommodation and supplies, and of personnel. He also complained of the treatment of the medical orderlies, and said that of the medals of honour allotted for distinguished service in Morocco the Red Cross Society got thirty-seven, the army medical orderlies five. C. E. P.

Leprosy.—Major P. C. Field, Medical Corps, U.S.A. (*Military Surgeon*, June, 1912) has been investigating the lesions caused by leprosy to the eye, ear, nose, mouth and throat. While doing so he protected himself from infection by using rubber gloves, gauze face mask and operating gown. One of the most constant and early signs of leprosy is an indefinite fulness of the skin of the lower eyelid and adjoining cheek, and also the nose. In 85 per cent. of the forty cases examined, an active and destructive ulceration of the anterior nares, especially of the tip of the inferior turbinated bone was found. The posterior nares was not involved in any of the cases. The anterior pillars of the fauces were usually inflamed. In half the cases the epiglottis was thickened. The author, as a result of these investigations, is of opinion that the anterior nares is the site of the initial lesion. C. E. P.

Work of the Medical Services during the Fight at Moul-el-Bacha.—Méd. aide-major Salètes (*Archiv. de Méd. et Pharm. militaires*, May, 1912) gives a graphic account of his experiences during an attack on the camp. The force was a mixed one, and consisted of roughly 400 men; it was sent to reconnoitre a ford on one of the recently opened routes. There were two medical officers, some medical orderlies, one mule with litters, and two with cacolets with the force. No fighting was anticipated. The force had encamped and had been joined by another reconnoitring party of about 500 strong, when about 11 a.m. several hundred armed natives approached the camp and took up a position on a hillock about 1,000 yds. distant. The assembly was sounded, and the neighbouring crests were occupied. Some of the enemy came up to within 30 paces of the camp and demanded that the French should at once retire. As trouble appeared to be imminent a dressing station was formed in the middle of the camp. Suddenly the order to commence firing was heard; and immediately afterwards a hot fire broke out from both sides, and a hail of bullets began to pour into the camp. The company of the Foreign Legion drove the enemy into the river at the point of the bayonet. Wounded began to arrive rapidly, and two killed were brought in. The enemy took up a position on the opposite bank and fired into the camp from two sides. It was not possible to provide any cover for the dressing station. Wounds were rapidly dressed, tincture of iodine being painted on the surrounding skin before applying a dressing. A bottle of champagne was opened and shared among the wounded, this helped to cheer them under their somewhat trying conditions.

After three hours' fighting, casualties had ceased to occur, and the commander decided to move his camp to some higher ground. The senior medical officer was ordered to prepare for the move and report

when he was ready. Wounded were placed in litters and cacolets, and the dead tied on to pack mules. The enemy's skirmishers at once opened fire on the party, and one of the escort was shot dead, while a similar fate befel a horse. On reaching the selected plateau it was not found to be suitable, the retirement was therefore continued. The hospital convoy here joined the baggage of the force, and proceeded with it. The medical officers remained with the rear guard which covered a line about 1 km. in length. The numerous wounded were dressed and sent to join the convoy. The enemy's force was steadily increasing. As they fancied that the French were being forced to retire, they grew bolder and the casualties increased rapidly. Litters, stretchers, pack animals and troopers' horses had to be employed to bring off the dead and wounded, many of the latter without being dressed. The heat was intense, and everyone was exhausted. Finally after six hours' fighting, three of which had been taken up in retiring 3 km., the force emerged on to the plain, the enemy's attacks ceased, and a bivouac was formed. The casualties amounted to nine killed and forty-seven wounded; of the latter eight had abdominal wounds, three had thoracic wounds, one man had the right eye and nose destroyed as also a fractured thigh, three were cases of compound fracture of the thigh, and three had a compound fracture of both bones of the leg. The officers gave up their bedding for the use of the wounded; morphia was freely injected to relieve pain. Two of the abdominal cases died during the night.

Next morning reinforcements arrived, bringing with them four mules with litters, and eight with cacolets. Awaiting evacuation there were thirteen lying-down patients, sixteen sitting-up for cacolets and a number fit to ride. The litters could only take eight lying-down cases. The senior medical officer therefore asked for sixteen men for each of the five stretchers to carry them the 15½ miles to Taouirt; this request was approved. The twelve dead were fastened on pack mules, and taken to Taouirt for burial. The temperature was 113° F., and the march most trying for everyone, but especially for the wounded. Two of these, both abdominal cases, died before reaching Taouirt; two of the remaining abdominal cases died during the following days. In each of these cases death was due to peritonitis, the result of being given food and drink by their kind-hearted comrades during the night in bivouac. Of the eight abdominal wounds, six died of internal hæmorrhage or peritonitis.

C. E. P.

The Training of Youth in Voluntary Aid Detachment.—Dr. Erich Will, *Stabsarzt* in the Reserve, and President of the Red Cross Voluntary Aid detachment in Königsberg (*Der Deutsche Kolonnenführer*, July 1, 1912) describes an instructive experiment carried out by his detachment. In the autumn of 1911 the committee of the detachment suggested to the authorities of the secondary schools that the pupils should be instructed in first aid by the Voluntary Aid detachment. This offer was accepted, and names of pupils who wished to attend were asked for. In a short time some 300 names were handed in. This was more than had been anticipated, but the Voluntary Aid detachment accepted the task of instruction. The youths were divided into six sections, and a cyclist section.

The plan of instruction was as follows:—

January to April.—(1) Squad and stretcher drill by the V.A.D. instructors. (2) Classes in anatomy, physiology, bandaging, &c.

May to September.—(1) Field work, pitching tents, digging kitchens, making foot bridges, rafts, &c. This instruction was given by the officers and N.C.O.s of the pioneer regiment in garrison. (2) Tactical exercises under the instruction of the V.A.D. committee.

October to December.—Improvization, instruction by means of models, and repetition courses.

The municipal gymnasium was lent by the town authorities, and used as a classroom. Altogether 220 of the boys attended regularly in the evenings.

At first the badges of the Red Cross Society were worn by the boys. This was soon forbidden, as also any reference to the Red Cross Society in their title. The boys then wore white caps with the German cockade and plain white arm bands. They are affiliated to the "Samariterabteilung Jungdeutschland."

The value of this training can hardly be over-estimated.

In addition to the useful instruction in first-aid work the boys were subjected to discipline, learnt to be punctual at drills, and to be considerate to their neighbours; the exercises in the country awakened a love of nature, and took the boys away from the streets. The general improvement in the bearing of those who completed the course was ample testimony of the good which had been effected. C. E. P.

The Examination of Recruits for Typhoid Carriers.—In the autumn of 1911, Stabsarzt Dr. Hüne (*Deutsch. militär. Zeit.* May 5, 1912), caused inquiries to be made among the year's contingent of recruits for the II Army Corps to find out how many men had suffered from typhoid fever or in whose families there had been a case of typhoid fever during the preceding twelve months. There were 154 of the former and thirty-six of the latter class. The blood of these men was then tested for Widal's reaction, and specimens of each of their blood and urine were examined on three occasions at intervals of a week for typhoid bacilli. As a result, two carriers of *B. typhosus* and two of *B. paratyphosus* were detected. No relation could be established between the titre of agglutination and the fact of a man being a carrier. The carriers of *B. typhosus* were discharged from the service, those of *B. paratyphosus* were retained under special observation. C. E. P.

The Army Medical Service at the Fight of D'El-Mennaba.—M. A. M. Coudray (*Archiv. de Méd. et Pharm. militaires*, No. 4, April, 1912) gives a brief description of the medical work during this fight. The column, which comprised 985 men of all arms, while in camp at 4.30 a.m., on the morning of April 16, 1908, was surrounded and fiercely attacked by a large *harka*. After two hours' hard fighting the enemy was driven off. The French casualties were twenty-three killed and ninety-eight wounded. The *ambulance* was placed in the middle of the camp. As soon as it became light this spot attracted a heavy fire from the enemy and many of the wounded were hit a second time while being dressed.

The column had a good supply of sterilized dressings of the regulation sizes; these were applied dry without any previous preparation of

the skin; this permitted the rapid application of dressings, an important advantage, as the wounded had to be evacuated at once.

The column was provided with four pairs of mule litters, six pairs of mule cacolets and six stretchers. The commandant of the column handed over six *arabas* which had been used to convey supplies, twenty riding mules from one of the mounted companies and twenty supply camels. The camels were used for the transport of wounded native soldiers by fastening a sack of barley to each side of the pack saddle, leaving a slight depression between them in which the wounded man was placed; although not particularly comfortable this afforded a safe means of transport. The most serious cases were carried on stretchers. The convoy of wounded was sent with a small escort to the post at Talzaza, $7\frac{1}{2}$ miles distant. The wounded suffered a good deal during the journey not only from the pain caused by their wounds but also from fear of being attacked by the enemy. The convoy had to proceed at a very slow pace, but reached its destination safely by nightfall. C. E. P.

Wound of the Intestine by Blank Cartridge.—Stabsarzt Dr. Petzsche (*Deutsch. militär. Zeit.*, April 20, 1912) reported a most interesting case of attempted suicide. The man was wearing his working uniform and had not had any food for about twelve hours. He loaded a service carbine with blank cartridge and holding its muzzle with his left hand close to the middle of the abdomen he leaned over and pulled the trigger with the thumb of his right hand. He then fell to the ground and became unconscious. About half an hour later he was found and carried to hospital about half a mile distant.

On admission he was conscious, but collapsed. Between the navel and left costal margin there was a round ragged opening about the size of half-a-crown. He was immediately placed on the operating table. The skin was painted with iodine and the abdomen opened by a median incision. The peritoneal cavity contained a quantity of blood but no stomach or intestinal contents. The great omentum showed many small hæmorrhages and one tear. On the greater curvature of the stomach there was a rounded wound about $\frac{1}{4}$ in. in diameter with protruding mucous membrane; this was sutured. A wound about $\frac{1}{2}$ in. in length in the duodenum was next sutured. The wadding was found lying against a bruised spot in the duodenum. A bleeding point in the great omentum was next ligatured. Numerous ecchymoses were observed in the small intestine and peritoneum. A gauze drain was inserted through the original wound and the operation one sutured. Transfusion was carried out and the patient put back to bed. A severe attack of bronchitis ensued, the accompanying cough threatened to break down the union of the wound, but in spite of this he steadily improved. About ten weeks later the original wound which had not healed was carefully probed and a splinter of wood withdrawn, after which it quickly healed. He was returned to duty exactly three months from the date of the original injury and took part in the annual manœuvres held a few weeks later. C. E. P.

Sun-baths.—Haberling (*Veröffentlich. a. d. G. d. Militär-Sanitäts-wesens*, H. 50, 1912) reviews the literature on the subject of sun-baths, to which he gives thirty-five references. He thinks that their efficacy has

been over-rated and that the reports of the vaunted cures by means of them must be received with scepticism. C. B.

On the Use of Oxygen.—Landgraf and Kraus (*Veröffentlich. a. d. G. d. Militär-Sanitatswesens*, H. 51, 1912) think that oxygen administration has only a limited scope in the German army. Occasionally it may be required in cases of gas poisoning. It has proved to be of no value in pneumonia and heat-stroke. They are of opinion that only the larger hospitals need an oxygen apparatus. C. B.

Syphilis mistaken for Malignant Diseases,—Ochsner (*Münch. med. Woch.*, November 21, 1911, p. 2533) reports four cases of tertiary syphilis, which had been referred to him for operative treatment under the erroneous diagnosis of malignant disease. They all recovered on administering salvarsan or mercury. A man, whose blood was negative to the Wassermann test, was suffering from a tumour of his neck with general enlargement of the neighbouring glands. The resemblance to a malignant growth was striking. In another instance a gumma of the tongue was believed to be a sarcoma. The serum reaction was negative. A suspected sarcoma of the upper jaw disappeared after salvarsan. A case of cancer of the rectum was cured with the same remedy. He performed laparotomy on a girl who had been subjected to operation twice before for "tubercular peritonitis." He discovered a syphilitic growth in the lower part of the abdomen and no evidence of tubercle. Recovery under salvarsan was complete.

Ries relates similar experiences. A gumma of the foot had been incised. It remained unhealed for two months but got well rapidly when specific treatment was adopted. A boy was supposed to be suffering from liver abscess. A tumour of the liver was found on abdominal section, which appeared to be sarcomatous. Specific therapy however, brought about a cure. Ries raises the dose of iodide of potassium to 50 or 60 grm. a day in refractory cases.

Reishmann mentions an instance of a large node on the clavicle which had been mistaken for sarcoma.

Riebel records a case of syphilis which resembled Banti's disease. Mercury was given with success. C. B.

Army Medical Service, France. Technical Committee. (*Journal Officiel de la République Francais*, 1912, p. 1701).—The Minister of War having pointed out that the terms of the law of 1882 were not fulfilled by the present *Comité technique*, the President of the Republic issued the following Decree, dated February 22, 1912.

DECREE.

Art. 1.—The *Comité technique* of the Army Medical Service will in future be known as the "*Comité consultatif.*"

Art. 2.—This committee will be composed of eleven members thus: Not more than eight members selected from among the surgeon-generals of the Army Medical Service; at least two members selected from among the surgeon-generals of the Colonial Army Medical Service; The Pharmacien-Inspecteur of the Army Medical Service.

Army Medical Service, France. Formation of a Technical Section subordinate to the Comité consultatif appointed by the

Decree of February 22, 1912. (*Journal Officiel de la République Francais*, 1912, p. 7,253.)—The President of the Republic has issued the following Decree, dated August 7, 1912:—

Art. 1.—The technical section of the medical service already constituted for the purpose of undertaking research work for the *Comité consultatif* of the medical service will be a special establishment directly under the Minister of War.

Art. 2.—The chief of the technical section, who is its director, will control all funds at its disposal. He will likewise administer the funds, material and personnel provided for the maintenance of the *Comité consultatif*.

Art. 3.—Instructions will be issued by the Minister to determine the composition, the means of action and the method of administering the technical section; these instructions will define its powers in regard to establishment and its functions as a research body, also the distribution of its personnel.

Art. 4.—Previous instructions are cancelled.

Art. 5.—The Minister of War will carry out the present decree.

Ministerial instructions fixing the organization and functions of the technical section of the Army Medical Service.

CHAPTER I.

Functions of the Technical Section of the Army Medical Service.

Art. 1.—The technical section is a special establishment constituted for research work and except as hereafter stated is placed under the direct authority of the Minister of War.

Art. 2.—The duties of the technical section are to investigate and consider all questions of hygiene, prophylaxis of epidemic disease, the general organization of the medical service in peace and war, together with its regulations and methods; the technical section will make suggestions for improving these; in short, it will deal with all questions concerned in adapting the Army Medical Service to the needs of the army.

Art. 3.—It will also participate under the conditions enumerated below, in the investigation of all medical financial questions which may come before the *Comité consultatif*.

Art. 4.—It will be responsible for the publication of the "Archives de Medécine et Pharmacie Militaires" (*Army Medical Journal*) and for army medical statistics.

Organization.

Art. 5.—The technical section comprises three "services" and different laboratories, the organization and duties of which are as follows:—

(1) *Hygiene and Prophylaxis Service.*—This service will investigate the following subjects: recruiting, invaliding, selection of the annual contingent; food, clothing, equipment, camps; barracks, furniture, warming, and lighting; garrisons, temporary and permanent camps, cantonments; the biological education and training of the soldier; hospitals, sanatoria, and convalescent depots; epidemic diseases and their prevention. This "service" will also be responsible for army medical statistics and the publication of the "Archives de Médicine et de Pharmacie Militaires" (*Army Medical Journal*). This "service" will have:—

(*a*) A laboratory for chemistry.

(*b*) A laboratory for bacteriology.

(*c*) A laboratory for experimental biology and morphology (to be provided later).

The chemical laboratory will be situated in the "Invalides," and will undertake research work for the chief of the technical section.

The bacteriological laboratory in the Army Medical School will be used as a training school for expert bacteriologists whose services will be available when required in any army corps for the investigation of epidemic diseases or for special pathological investigations.

(2) "*Service*" *for the General Organization of Army Medical Services in Peace and War.*—This "service" is responsible for questions concerning the general organization of the Army Medical Service, for the instruction and employment of the personnel of the regular Army Medical Service, of the auxiliary Army Medical Service, for all medical and surgical supplies and equipment, for dealing with offers and inventions. It will also deal with the administration of the Army Medical Service, the equipment of field medical units, means of transport, evacuation and hospital accommodation, mobilization, and the employment of voluntary aid.

(3) *Service du Contentieux Medical* (*Finance*).—This "service," acting under instructions from the President of the *Comité consultatif*, is responsible for examining in the first place:—

(*i*) All financial questions which are submitted to the *Comité consultatif* in regard to pensions, gratuities and claims arising out of accidents among the civil personnel of war establishments.

(*ii*) If required to do so, it will consider and report on all proposals, decrees or instructions on the subject of pensions, gratuities or compensation for accidents.

Personnel.

Art. 6.—The technical section will be composed as follows:—

(*a*) Military Personnel.

A colonel of the Medical Service (Méd. Principal 1re. or 2me. Classe) as chief of the section. This officer will communicate directly with the chiefs of the different technical sections, chiefs of (army) corps, senior medical officers of hospitals, &c. He will direct the work of the section. He will have all the attributes of a *chef de corps* in regard to the military personnel of the section. He will perform the duties of secretary of the *Comité consultatif de santé* with power to delegate all or any of these duties to a member of the section. He will be the head of the Army Medical Statistical Service, and director of the publication of the *Army Medical Journal.*

A médecin Major 1re. Class (Major) who will assist the chief of the section in regard to statistics and the publication of the *Army Medical Journal.*

An officer of administration, 1re. Class (quartermaster and captain), who will assist in the work of the section, and be responsible for the general management of the work of the technical section and of the *Comité consultatif.*

Three majors or lieutenant-colonels of the Medical Service as chiefs of the three *services* mentioned above (hygiene, organization, finance), and to whom one or more officers of the Medical Service may be attached;

the latter will be *ex-officio* members of the section. A major or lieutenant-colonel of the Medical Service, *ex-officio* member of the section and chief of the bacteriological laboratory.

A pharmacist captain or major, *ex-officio* member of the section, chief of the chemical laboratory. This officer will, in addition, supervize the pharmaceutical service and the national establishment of the *Invalides*.

A major of the Medical corps, *ex-officio* or honorary member of the section, and chief of the laboratory for biology.

In addition to the above the technical section will comprise honorary members, nominated annually by the Minister, and who will assist in the work of the section in addition to performing other duties.

The personnel of the finance branch (*Service du contentieux*) is under the president of the *Comité consultatif* for the investigation of all questions raised by the *Comité*, and the chief of this *service* is the reporter to the *Comité*.

In regard to the personnel of the technical section the president of the *Comité* has the attributes of a director of Medical Services and of a commander of an army corps, especially in regard to recommendations for and promotions in the Legion of Honour; proposals of this kind will be submitted to him by the chief of the technical section.

The subordinate personnel (services des bureaux et laboratoires) comprises a sergeant or corporal of the 22nd section of medical orderlies, and as many orderlies as may be required.

(*b*) Civilian Personnel.

Civilian personnel may be employed by the chief of the technical section as required for the work of the section, and of the *Comité* in accordance with the decrees of February 26, 1897, and May 11, 1907. This civilian personnel will not participate in any way in the central administration.

Chapter II.

Administration and Accounts.

Art. 7.—The technical section will form an autonomous establishment in the medical service with its own budget. The chief of the section will supervize the expenditure. He will administer the funds, personnel and material, provided for the maintenance of the *Comité consultatif*. The interior economy of the technical section and its annexes (laboratories, libraries, records, &c.) will be under the control of the administration officer on the committee. All administrative questions concerning the work of the *Comité consultatif* and of the *Commission supérieure* of hygiene and epidemiology will be dealt with by the technical section. The records and library will be in common for the *Comité consultatif* and the technical section.
C. E. P.

Venereal Prophylaxis.—Surgeon R. Bachmann, U.S. Navy (*Military Surgeon*, August, 1912) describes a method of venereal prophylaxis which he has found to be highly efficient. This consists of an ointment containing 4 per cent trikresol and 30 per cent calomel, in collapsible tubes. The tube has a soft rubber nozzle $1\frac{1}{2}$ in. long. After exposure the man is directed to insert the nozzle into the urethra and express 2 c.c. of the ointment, which is left in the urethra. The whole of the outer surface of the penis is then to be carefully smeared over with the ointment.

Bachmann records an interesting practical experiment which demonstrated the value of the ointment. The tubes are sold on board ship for 7½d.

In the same Journal, Major W. T. Davidson, U.S. Army, described the following plan which was successfully employed at Fort Laredo, Texas, where the incidence of venereal disease had become excessive. Men who exposed themselves were ordered to use one of the Army and Navy protection tubes and carefully follow the directions on it. On his return to barracks he was made to report to his serjeant and state whether he had used the Army and Navy tube or not. A note of his report was made in a report book. He was then sent to hospital where a 1 to 1,000 solution of nitrate of silver was injected into his urethra and retained for five minutes. Calomel ointment was then rubbed on his glans and foreskin. A record of his attendance was made. Any man failing to comply with these orders was court-martialled. On pay day the streets of the town were patrolled and any drunken soldiers found were sent to the guard room. Weekly examinations by a N.C.O. of the medical corps were also instituted. Since adopting this plan, 127 men have reported themselves after exposure to infection, but none of them has developed venereal disease.

Detection of "Treponema pallidum" by inoculating rabbits.—Uhlenhuth and Mulzer (*Cent. f. Bakt.*, Orig., June, 1912) continue their report (see JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, June, 1912, p. 712) on the virulence of the blood and secretions of syphilitics, when injected into the testicles of rabbits. Blood taken from a patient in the primary stage of syphilis and inoculated into the testes of a rabbit induces a typical lesion in which treponemata are found, although the man may have no glandular enlargement and though his blood may be negative to the Wassermann test. The blood of florid cases of syphilis is always virulent to rabbits. In latent syphilis it is sometimes infective. The blood of a mother who gave birth to a syphilitic child was infective, though she was free from symptoms. Her serum, however, was positive to the Wassermann reaction. In tertiary syphilis the blood seldom excites the disease in rabbits. Milk and cerebrospinal fluid gave negative results.

The semen and blood serum of luetics in the early secondary stage are virulent. Specific treatment diminishes the chance of successful inoculation of rabbits. The time of appearance of the orchitic lesion varies from thirty-eight to one hundred and one days after injection of the syphilitic material. Syphilis, therefore, is a chronic septicæmia. As a means of detecting the presence of the *Treponema pallidum*, the rabbit testicle inoculation far surpasses in delicacy microscopical examination, even when the spirochætes are collected together by long centrifuging.

The early invasion of the blood by the *T. pallidum* explains the failure to avert secondary signs which so frequently follow excision of a hard chancre.

C. B.

Physical Test for Recruits in the Netherlands.—A Royal Decree published in the *Nederlandsche Staatcourant*, No. 153, 1912, fixes the conditions for the Certificate of Physical Proficiency; the possession of this certificate allows the conscript to join two months after the normal time, and entitles him to a choice of corps and garrison as far as possible. The tests imposed are as follows:—

(*a*) Certain exercises with an iron bar weighing 6 lb.

(*b*) Free exercises.

(*c*) Running 500 metres in 3 mins. with the bar, 100 metres in 16 secs. without.

(*d*) Jumping. Of various kinds with and without the bar. Height, 1 metre with bar, 1 metre 20 without, broad jump, 3 metres 50 with bar, hop, skip, and jump 8 metres 50. Also pole jumping, 1 metre 70 high and 4 metres wide and vaulting.

(*e*) Weight lifting. To lift a bar of 60 lb. from the shoulder to the full extent of the arms six times.

(*f*) Putting a 15 lb. shot 6 metres, standing, with either hand.

(*g*) Throwing the 6 lb. bar 8 metres at a target 2 by 1 metre.

(*h*) Climbing the rope with the help of the legs, 5 metres.

(*i*) Pulling up on a bar four times.

(*j*) Exercises in balance on a boom.

(*k*) Marching. Two marches on consecutive days of 25 and 30 km., to be made in not less than six and seven-and-half hours respectively. These marches to be carried out on hard roads and in ordinary clothing and boots. The candidate to arrive in good physical condition.

(*l*) Playing. Proficiency in a game of ball, whether football, hand-ball, throwing or basketball.

(*m*) Swimming. A proficiency in swimming on back and breast.

(*n*) Certain tests with fixed gymnastic apparatus.

All tests of a purely military nature have been avoided. The 6 lb. iron bar, however, with which many of the exercises are carried out, bears a reasonable resemblance to a rifle. The most important test is, doubtless, the marching, the Dutch having become of late years, owing to the universal adoption of the bicycle, very indifferent walkers. The task of supervising the operations of this decree is confided to the Minister of War, not the Minister of the Interior, as was indicated in the original Bill.

C. E. P.

Venereal Prophylaxis.—Major F. F. Russell and Captain H. J. Nichols, of the Army Medical School, U.S.A., record some interesting experiments (*Military Surgeon*, August, 1912) to determine the efficiency of the Army and Navy tube as a gonococcicide.

Men who reported sick with gonorrhœa were sent to the Army Medical School, where a smear was made from the urethral discharge to verify the presence of gonococci; when these were found cultures were made on ascitic agar. The contents of the tube were then injected into the urethra and retained for one or two minutes. After fifteen minutes the patient was told to pass his urine, after which fresh smears and cultures were made from the fluid expressed from the urethra. Using the original Army and Navy tubes, in seven out of eight cases the gonococci present were found to have been killed by the ointment. The formula of the ointment was:—

Camphor	3 parts
Phenol	3 ,,
Calomel	25 ,,
Lanolin	25 ,,
Rendered lard .. .. q.s. to	100

Other formulæ not containing camphor or lard were not found to be of a satisfactory consistency. Argyrol in 10 per cent strength and

Protargol in 2 per cent strength, when subjected to similar tests, gave fairly satisfactory results, showing that within the urethra these salts have a gonococcicidal action. C. E. P.

Report of the Tropical Diseases Board, Philippine Islands (*Military Surgeon*, August, 1912).—The Board have concluded a long series of observations as to the relative suitability of blondes and brunettes for residence in a tropical climate. They have come to the conclusion that blondes are quite as well able as brunettes to withstand the influences of the Philippine climate, and that there is no proof that pigmentation is *per se* beneficial in the Tropics. The hæmoglobin readings and colour index, the blood-pressure and body temperature were not apparently affected by residence in the Philippines; the body weight was reduced by 2·27 per cent at the end of the first year of residence.

In discussing the causes of morbidity, mortality, and of invaliding among white troops in the Philippines, the Board have prepared three tables, and make the following comment:—

"Considering as 'tropical diseases' the diarrhœas, the dysenteries, and the chronic enteritis, the liver abscesses, the sprue, the cholera, the malarial and undetermined fevers and dengue, the ringworm and the insolation, we find that these combined maladies caused 26·2 per cent of the admissions, 15·2 per cent of the days lost from sickness, and 9·3 per cent of the invaliding, and 12·5 per cent of the deaths. The total death-rate from diseases (excluding suicides and injuries) approximates 3 per 1,000 annually. The amount of disability, death and invaliding now being caused by dysentery and its sequelæ is astonishingly small, being about 6 per cent of the total in each of the three tables. Venereal disease caused one-quarter of the sickness among the 1,000 soldiers, and tuberculosis caused one-quarter of the invaliding home. Apart from tuberculosis, the mental and nervous diseases were the largest causes of invaliding, but a great number of the mental cases were found to have existed prior to enlistment, and a study of the statistics in the reports of the Surgeon-General of the Army for the years 1904 to 1909, inclusive, brings out the fact that the incidence of mental and nervous diseases during the five-year period was no higher in the Philippines than at home. The number of suicides shown in Table IX. may seem considerable, but the statistics from the reports of the Surgeon-General for the years 1904 to 1909, inclusive, show that the death-rate from suicide was not materially higher in the Philippines than at home. It may be concluded, therefore, that during the last few years there has been manifest no evidence of any serious effect on the nervous systems of our soldiers as a result of the Philippine climate. The more rapid the eradication of the idea that the climate, *per se*, injuriously affects the nervous system, the more rapid will be the decrease of such mild forms of neurasthenia and irritability as are due largely to a preconceived dread of the effects of Philippine residence. It seems to us that the figures in Tables VII., VIII. and IX. are strong evidence in favour of the assumption that most of the morbidity, which formerly occurred as a result of residence in the Tropics, was due not to the climate, *per se*, but to infections which, in the light of present knowledge, can almost entirely be avoided by good sanitation."

Experimental Measles.—In the year 1852, Mayr proved by experiment that the buccal secretions of measles patients caused the infection

in man. In 1898, Chavigny reported that a monkey had contracted measles from his keeper. In 1905, Hektoen inoculated healthy people with blood abstracted from a patient in the eruptive stage of the disease; they contracted the infection. In 1910, Anderson and Goldberger induced measles in monkeys by injections of virulent blood into the peritoneal cavity. They have carried the virus through six passages in these animals, although they could obtain no growth of it *in vitro*. They also ascertained that the secretions from the mouth, throat and nose of measles patients were infective to apes. Epidermal scales were harmless.

Hektoen and Eggers (*Journal of the American Medical Association*, December 2, 1911, p. 1833) have confirmed the results of the previous observers. They find that the leucocyte curve of the infected monkey corresponds with that of the human disease. There is a preliminary leucocytosis followed by leucopenia in the pre-eruptive and early part of the eruptive stage. Lucas and Prizer (*Journal of Medical Research*, April, 1912, p. 182) injected 2 c.c. of the serum of blood drawn from a child suffering from measles six hours before the appearance of the rash, into the brain of a *Macacus rhesus*, and 3 c.c. into its peritoneal cavity, and 5 c.c. of a mixture of corpuscles and serum into the brain and peritoneum of another *rhesus*. Six days later both animals sickened with measles. Koplik's spots appeared on the mucous membrane of their cheeks, and the skin of their faces became erythematous; conjunctivitis and coryza were observed. They determined by further experiments that the virus is present in the serum for some period exceeding twenty-four hours before the appearance of Koplik's spots, and that it persists until more than thirty-six hours after the breaking-out of the rash. During the pre-eruptive stage they noted leucopenia, on which all the leucocytes were relatively decreased. This is preceded by a transient increase in the lymphocytes and large mononuclears.

C. P.

Correspondence.

THE SANITARY SERVICE, TERRITORIAL FORCE.

TO THE EDITOR OF "THE JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—I had the opportunity of reading the paper contributed by Major F. E. Fremantle to *Public Health* for February, to which he refers in the paper he read on the Sanitary Service, Territorial Force, before the United Services Medical Society.

An intimate acquaintance with the Territorial Force in a large divisional area makes me believe that the somewhat pessimistic opinions expressed in the contributions referred to are not entirely warranted; certainly my own experience makes me confident that effective sanitary effort can be established in the Force on orthodox lines even when the conditions are in no way peculiarly favourable for waking up those immediately concerned to the importance of sanitation from any point of view. I trust that what is within my own experience is not mis-eading, for if field army sanitation is to succeed it must be based on

effective *unit* sanitation ; mobility, the essential property of a field army. alone renders it futile to attempt to cope with sanitation in the field on any other basis. Since divisions are intended to be capable of moving rapidly and over wide areas, and of being broken up into smaller formations, the size and composition of which must quite often be hurriedly arrived at, it is absolutely essential that every field unit should contain within its ranks the personnel trained to deal with unit sanitation. It is impracticable for any sanitary unit or formation, whether established in a divisional area or tacked on to a division, to deal readily and effectively with field army sanitation in the quickly varying conditions of war. Even divisions of the Territorial Force do not invariably concentrate for annual training within their own divisional areas, and if they did do so it would be useless to organize a sanitary service suited only to that arrangement, since a Territorial division is intended on mobilization to be as highly mobile as a Regular division; their sphere of action is not intended to be limited to the areas in which they are located in peace.

The division to which I refer above has twice undergone training as a complete division and on two other occasions it has concentrated for training less one brigade of infantry, two brigades of field artillery, an A.S.C. brigade company and a field ambulance. One divisional training took place outside the divisional area. This year and last year the whole of the sanitary services have been carried out by the regimental sanitary detachments with complete success in spite of unfavourable conditions of weather and ground. No special sanitary surveys have been needed, as information has invariably been most courteously given on all points by medical officers of health. The officers in medical charge of units are for the most part men in general practice, none of them are specially engaged in public health work; their keenness and energy cannot be disputed, and it is difficult to see how they could have attained greater success whatever the nature of their civil work might be. Though during training in camp the water squads have practically no water duties there is no certainty that this would be the case if a state of war arose in Great Britain; but even if in such circumstances water supplies remained good and sufficient it would be well to retain these squads, with infantry at least, since the N.C.O's and men would prove invaluable for taking charge of the hastily recruited and untrained bearers who almost certainly would be required to augment the meagre personnel employed in and about the first line of assistance.

The task of the medical officer should, I think, be one of guidance and instruction: sanitation cannot be dealt with by the Medical Corps alone, it must be taken in hand by the whole military community.

I am, Sir, &c.,

J. H. P. Graham,

September 20, 1912. *Major, R.A.M.C. (S.R.)*

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J. T. Fotheringham
H. Col.

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TYPHUS FEVER.

BY LIEUTENTANT-COLONEL C. BIRT.
Royal Army Medical Corps.

NICOLLE [1], Conseil, and Conor [2] in Tunis, and Anderson, Goldberger [3], Ricketts, and Wilder [4] in North America, have undertaken recently a series of remarkable researches on the nature of the contagium of typhus fever, and the mode of its transmission. They have shown that the body-louse is the agent which disseminates the virus. The history of past epidemics, therefore, affords an interesting study when viewed in the light of this discovery. Facts hitherto inexplicable become obvious when the bionomics of pediculi are considered.

Warburton [5] published a short account of the life-history of the body-louse in 1910. He could find very little reliable information on the subject. Unlike many other insects of parasitic habits, pediculi are very sensitive to any change in their environment. They quickly succumb when they are kept at a temperature of 37° C. Exposure to cold is inimical to them. Hence they soon perish in cast-off clothing. This may be the origin of the tradition which attributes unhealthiness to wearing the same underclothing night and day, and to infrequency in washing and changing it. The adults are reluctant to release their hold of the garment, even while feeding. The larvæ on the other hand are very active, and scatter themselves broadcast. They may be infected by hereditary

transmission of the typhus virus. It seems probable that the disease was spread in this manner at the various "Black Assizes" of which there are accounts of six. In the year 1577 was the notorious Oxford "Black Assize." The Chief Baron of the Exchequer, the Serjeant-at-Law, two sheriffs, one knight, five justices of the peace, and most of the jury were seized with typhus; 510 persons in all perished. The Protestants ascribed the outbreak to the diabolical machinations of the Papists. The Catholics regarded it as a miraculous judgment on the Protestants. The last "Black Assize" was held at the Old Bailey in 1750. A hundred prisoners were tried, and the court was crowded to excess. More than forty people died of typhus, including the Lord Mayor, two of the judges, an alderman, an under-sheriff, and several of the jury.

Pediculi in both the larval and mature stages immediately suck blood when they come in contact with the human skin. Therefore the risk of infection on approaching a verminous typhus patient is great. Six hundred of the attendants in the French hospitals in the Crimea were attacked with typhus fever during a period of two and a half months in the year 1856.

A female body-louse was observed to lay 124 eggs in twenty-five days. The ova resist great variations of temperature, and may preserve their vitality for five weeks, or even longer, according to Fantham [6]. The life cycle from ovum to ovum may be completed in twenty days, or may be extended to twelve weeks, thus: Ovum, four days to six weeks; larval stage, eleven days, during which three moults occur; imago, sexually immature, four days; imago, sexually mature, male, three weeks; imago, sexually mature, female, four weeks. The adult pediculi die if they are deprived of food for four days. The larvæ are unable to survive thirty-six hours starvation. The *Pediculus capitis* is more difficult to rear, and succumbs more quickly to unfavourable influences than *P. vestimenti*.

It causes no surprise that typhus fever was the constant accompaniment of warfare in times past. "Army fever," "camp fever," are names under which this disease was designated. In the year 1489, 17,000 of Ferdinand's troops, who were besieging Granada, perished from typhus, called by the Spaniards "tarbardiglio." In 1552 the army of Charles V. was devastated by it. In 1621 an outbreak occurred in the force encamped at Weidhausen. The epidemic spread through Bavaria and Germany. The Bavarian army lost 20,000 men. During the Thirty Years' War, 1619 to 1648, the whole of Central Europe was ravaged by typhus and famine. In the spring of 1658 typhus broke out in the garrison of Reading,

then besieged by Essex. It extended to the Royalist troops and the civil population. The whole of England suffered severely from its ravages in that year. One-third of the garrison holding Montpelier were destroyed by it in 1623. Sir John Pringle, Physician-General to His Majesty's Forces, in 1752 noted that a fever of malignant and deadly nature prevails in military hospitals, barracks, and transports when overcrowded and dirty. Lind, Physician to the Fleet, observed that typhus fever was a common malady on board ship, especially when men were kept at sea under close hatches, or detained long by contrary winds. Few ships escaped during the long voyages to and from North America.

In 1780 typhus was rampant among the Spanish prisoners who were confined at Winchester. Two hundred and sixty-eight of them died in three and a half months. A violent epidemic broke out in the garrison of Genoa, when it was besieged by the French in 1799. During the first fifteen years of last century this pest committed great ravages in the armies of Napoleon. It always arose under circumstances of misery and privation, more particularly among the inhabitants of beleaguered cities. The sieges of Saragossa, Torgau, and Dantzig bear melancholy witness to its devastations. Two-thirds of the French garrison of the last-named city, and one-fourth of its inhabitants, perished. Thousands lost their lives during the retreat from Moscow. Sir James McGrigor described an outbreak among the British troops during their retirement from Corunna in 1809. Of 25,000 French troops who escaped the disasters of 1813, and were afterwards besieged at Torgau, more than one-half succumbed to typhus within the space of four months. Twenty-five thousand of the garrison of Mayence, the strength of which was 60,000, died of typhus in the years 1813 and 1814. The ravages which typhus fever made among the Russian, French, and British troops in the Crimean War were appalling. During the first six months of 1856, in the French force of 120,000 men, 12,000 were attacked, of whom 6,000 died. Among the Russians this rate of mortality was exceeded. It might be asked, was not much of this mortality caused by enteric fever? Jacquet, in his work on Crimean typhus, declared that the absence of intestinal lesions in those who died of the Crimean fever was a well ascertained fact. He had collected upwards of four hundred cases, in not one of which were typhoid ulcerations discovered in the bowel. In the American Civil War, only 2,501 attacks of typhus fever were reported, of which 850 died. There was no epidemic of typhus during the Franco-Prussian War. Some

cases were observed in Metz during the siege. In the Russo-Turkish War of 1878 fearful havoc was caused by this fever; 100,000 soldiers were seized, of whom half perished. Typhus fever does not appear in medical statistics of the South African War. The Russian medical returns of the Russo-Japanese War include 351 cases and 62 deaths under the heading of typhus. The incidence in the Japanese army was nil. This historical evidence must make us pause before we predict the absence of typhus epidemics in campaigns of the future. The experience of the South African War showed how frequently cleanly men harbour parasites in their clothes after months of field service. The case reported by F. H. Bradley and F. Smith in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, August, 1912, points the moral that the infection may appear when least expected. Should the present Balkan War last through the winter, we must look for a heavy death-rate from typhus fever.

The name of Moczutkowski [7] should have a place of honour in the roll of medical heroes. In the year 1876 he inoculated himself with the blood of a typhus patient taken on the tenth day of the fever. Eighteen days later he was prostrated with a severe attack. The crisis occurred on the fifteenth day, but life-long damage to his heart was left behind. He had made previously seven abortive attempts to induce the disease in this way—five on himself. He delayed to make known this first successful human experiment until 1900. It attracted little notice at the time. In 1907 Otero [8] inoculated four persons, one of whom passed through a mild attack of typhus fever after an injection of 5 c.c. of typhus blood. In the following year Yersin and Vassal infected two men by inoculating them with half a c.c. of blood taken on the second and fifth days of the fever. The incubation periods were fourteen and twenty-one days respectively.

It might be supposed that the etiology of this malady could be unfolded by animal experiments. In 1874 Zuelzer [9] administered subcutaneously to ten rabbits 2 c.c. of blood, withdrawn from typhus patients at various stages of their illness. The animals which received the blood at the height of the fever died within four or five days. Those inoculated with blood abstracted after the crisis remained unaffected. Subsequent observers, however, have ascertained that typhus blood is not pathogenic to rabbits. It is only in the anthropoid apes that a disease can be excited which resembles the human infection in its clinical features. In the year 1909 Nicolle inoculated chimpanzees with 1 to 1½ c.c. of

typhus blood injected beneath the skin. After incubation periods of from eight to twenty-four days illnesses presenting the signs of the human typhus infection came on. One of these animals died. In order to induce the disease in the lower apes it is necessary to inject 4 or 5 c.c. of virulent blood into their peritoneal cavities. Then, after an incubation period of a week or a fortnight, thermometric observations will disclose a pyrexial attack which follows the course of the fever in man, although the constitutional symptoms may be in abeyance. A second injection of virus given at an interval of some weeks causes no febrile disturbance. Hence the animal has acquired immunity against the typhus contagium. Nicolle and his colleagues have found that the guinea-pig is susceptible to the intraperitoneal injection of 2 to 4 c.c. of typhus blood. The infection will pass unnoticed if the thermometer is not used regularly. The virus can be preserved for laboratory use indefinitely by passage from monkey to guinea-pig alternately.

No micro-organisms have been detected in the blood of typhus patients when examined by staining, dark-ground illumination, or by culture, in cases which have been investigated recently. The typhus virus passed through a Berkefeld candle in one of Nicolle's experiments. Goldberger and Anderson apparently induced immunity in a *Macacus rhesus* by an intraperitoneal inoculation of filtered typhus blood. Many negative results, however, are recorded. A quarter of a cubic centimetre of filtered serum caused no symptoms when injected beneath the skin of one of the latter investigators. But it must not be forgotten that the inoculation of the human subject with the unfiltered typhus blood has frequently resulted in failure to infect.

The virus is destroyed by heating for five minutes at a temperature of 55° C., and by drying for twenty-five hours. It resists a temperature of 0° C. for eight days. The serum of typhus convalescents has no influence on the infectivity of the virus when mixed with it.

Attempts to transmit the disease by means of mosquitoes, bugs, fleas, flies, and stomoxys were unsuccessful. Moreover the epidemiological evidence is against the transmission by these insects. Typhus fever is prevalent in oases in Africa where fleas are absent. On the other hand, fleas are abundant in the phosphate mines of Tunis, and bite Europeans and natives alike, yet the latter only are attacked with typhus. In parts of Mexico where typhus fever is endemic, there are areas free from the infection, although bugs

and fleas are numerous. Bugs are attached to localities and are rarely transported on the person.

The infection is conveyed by the *Pediculus vestimenti.* Nicolle has induced the disease in a chimpanzee and four other monkeys by permitting body-lice fed on typhus patients to bite them. Wilder in a similar manner infected seven monkeys out of ten on which he experimented. The disease was originated in two by rubbing the intestinal contents of lice into scarifications of the skin. The virus undergoes elaboration in the body of the pediculus, for Nicolle found that the insects were not infective until five days after feeding on virulent blood. The typhus contagium thus behaves like that of yellow and sand-fly fever, in which the virus is developed in the stegomyia and phlebotomus respectively. Neither of these diptera are capable of giving the disease until twelve days in the case of yellow fever, and a week in the case of sand-fly fever, after their infective repast. Wilder's experiments show that the virus in the louse is in a much more concentrated form than in the blood of a typhus patient. Whereas not less than 0·2 c.c. of virulent blood was required to infect a *Macacus rhesus,* the intestinal contents of six pediculi were sufficient to excite the disease. Nicolle has recorded two instances of human infection which was conveyed in each case by the bite of a single pediculus.

It is probable that there is hereditary transmission of the typhus contagium in the louse. Ricketts and Wilder reared 250 larvæ from the ova of infected lice. The mature offspring of this generation were allowed to feed on apes, which thereby became immune, although they presented no febrile disturbance. This passage of the virus through the ovum would explain the apparently spontaneous origin of certain outbreaks of typhus fever.

The knowledge which has been gained by experiment interprets the old observations on the contagiousness of this malady. Murchison [10], in his Treatise on Continued fevers, says that overcrowding and starvation are the most powerful predisposing causes. Ninety-six per cent. of 18,000 patients who were admitted to the London Fever Hospital during twenty-three years were inmates of workhouses or in receipt of parochial relief. Penury and want imply uncleanliness and verminous apparel. Human fœtid emanations were regarded as the exciting cause, yet Bancroft more than a hundred years ago noted that the naked slaves escaped, although they were densely crowded together in typhus-infected ships. In the year 1836 Perry published his observations on the propagation of typhus in Glasgow Royal Infirmary. The infection rarely spread

in the acute wards, where the patients were confined to bed. When they became convalescent and were transferred to other wards, wearing their own clothes, all who were not immune contracted typhus. Perry thereupon detained all his patients in the acute wards until their discharge, and so saved them from contagion. Murchison's experience was similar. His patients in the convalescent wards contracted typhus, but those in the acute wards did not become infected. He explained this by the fact that the convalescents were wearing their own clothes which "before admission had been saturated with the typhus poison, and to their being brought in closer contact with each other." This is further evidence in favour of the transmission of the virus to the ovum. During the period in which the typhus patient was confined to bed, the adult lice would perish in the disused clothing from cold and starvation, according to Warburton's observations. The ova, however, would survive, and would hatch as soon as the clothing was worn again. Now Nicolle has shown that the blood is no longer infective forty-eight hours after the crisis, and that the louse cannot convey the disease until five days after feeding on virulent blood. Hence it would appear probable that mature pediculi do not generally become infective by sucking the blood of a typhus patient after the second day of his convalescence. But should this have happened, it seems that the convalescent would have been discharged hospital before the virus had developed in the body of the pediculus.

In 1833 Tweedie wrote: "The laundresses, whose duty it is to wash the clothing of typhus patients, are so invariably and frequently attacked that few women will undertake this duty." Pringle has put on record that twenty-three persons who were employed in refitting old tents which had been occupied by typhus sufferers were seized. Seventeen of them died.

Murchison noted that physicians who auscultated those inflicted with typhus ran no small danger of contracting the ailment. He remarked that if fresh air be excluded articles of clothing retain the poison much longer than might be supposed.

Lind mentioned several instances in which infected ships continued to harbour the infection long after the victims had been removed. In the Crimean War similar examples were noted by Jacquet. A transport had disembarked typhus invalids. The passengers who next embarked were attacked, although they had not been exposed to infection elsewhere. These ship epidemics evidently had their origin in verminous bedding. Lind, in 1763, and Trotter, in 1803, stated that it was common knowledge

among the porters and nurses at Haslar that it was dangerous to touch bedding and clothing of typhus patients. Cheyne relates how a child, who had been discharged from a fever hospital, arrived at a charitable institution with a bundle of clothes which had not been disinfected. The woman who received the child was infected with typhus which ran through the establishment.

Murchison quotes a case of a nurse who was the intermediary in transmitting typhus from one patient to another, although she herself was not seized.

In 1799 the French troops in their retreat from Italy left typhus in their wake. Fifteen towns and villages were infected. It is recorded that the soldiers' bodies were so covered with filth that their shirts, unchanged for months, were glued to their skin.

In 1831, Henry, a scientific investigator far in advance of his time, proved by experiment the destructive influence of heat on the discharges of several of the exanthemata. He ascertained by tests on man that heating typhus clothing to 204° F. rendered it harmless.

The diagnosis of abortive attacks of typhus fever may be difficult. The older authors comment on the rarity of the ailment in children. Nicolle, however, has shown that the infection runs so benign a course in infancy that it is not recognized. He inoculated a monkey with the blood of a three-year-old boy who had had a few days' fever without marked constitutional symptoms. The animal contracted typhus after an incubation period of eight days. If 2 to 4 c.c. of the patient's blood be injected into the peritoneal cavity of a guinea-pig, after seven to sixteen days a four to eleven-day period of pyrexia may be noted, should the infection be typhus. A negative result does not exclude the disease, since some guinea-pigs are immune. Anderson and Goldberger have demonstrated that the ailment described by Brill in 1898, which occurred in New York, and is known by his name, is typhus fever. Monkeys which have been inoculated with the blood of a patient suffering from "Brill's disease" evince febrile disturbances similar to experimental typhus. Moreover, they are found to be immunized against the typhus virus. Animals, also, which have recovered from an infection with typhus virus are immune against that of "Brill's disease." Nicolle noted that leucopenia is always found in infected animals during the early stages of typhus fever. It is succeeded by leucocytosis, which is continued into convalescence, and lasts a month. He thinks this variation in the number of

leucocytes might be of diagnostic importance in atypical cases of the human infection.

Injections of the serum of typhus patients in the early stage of convalescence do not influence appreciably the course of the malady. Nicolle administered 265 c.c. to a man without benefit. He could not confirm the observations of Maranon, who stated that typhus fever is cured by salvarsan. Adrenalin does not check the fall of blood-pressure in adynamic cases.

The prevention of typhus fever is summed up in the destruction of pediculi. Forty years ago the prophylactic measures taught by experience ensured this. Murchison says: "When typhus is prevalent, no person, whether ill or not, ought to be admitted among the other inmates of a workhouse, without having a warm bath and other clothing, while his own clothes are being purified." And "when a typhus patient is brought to hospital, care should be taken to disinfect his clothes, before they are restored to him or to his friends. The underclothing ought to be immediately immersed in a solution of carbolic acid, Condy's fluid, or chloride of lime, and after twenty-four hours washed, boiled, and hung out in the open air. The outer clothing ought to be exposed for some hours to a dry heat of 212° F., then subjected to the fumes of sulphurous acid or chlorine, and afterwards hung in the open air. The linen and bed clothes used by typhus patients should be treated in the same way. They ought to be kept apart from those used by other patients." "The bedding ought to be taken to pieces, thoroughly washed and baked, and then exposed to the air. The bedstead should be washed with carbolic solution, Condy's fluid, or chloride of lime." "The same beds and bedding ought always to be reserved for typhus cases." "Friends, who visit the sick, should be prevented from sitting on their beds, or approaching close. All unnecessary visits are to be prohibited. Personal cleanliness, frequent bathing, and frequent changes of underclothing ought to be enjoined on every person who is exposed to typhus." "Abundant evidence might be collected to demonstrate the efficacy of the measures here recommended."

Jakob [11] has found that the pediculi of the horse and dog are killed in two or three minutes when exposed to the sun. Immersion in water for twenty-eight hours, or in a watery solution of 2 per cent. cresol for fifteen minutes, destroys them. Pediculi resist formaldehyde fumigation, but succumb to the concentrated fumes of sulphur. Hyde, in his recently published work on "Diseases of the Skin," states that a temperature of 160° F. to 175° F. is sufficient to kill lice and their ova.

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SOME MUSINGS OF AN IDLE MAN.[1]

By Colonel R. H. FIRTH.
Royal Army Medical Corps.

During recent months not a little of my time has had to be spent in making railway journeys. Those familiar with the conditions of Indian railroads will appreciate how much the traveller thereon is dependent, for hours together, on either reading a book, or thinking and musing. Personal idiosyncrasy not permitting of long periods of reading in a train, my idle hours have had to be filled by the less exhausting avocation of musing. At these times my thoughts have naturally covered a wide range, and it has occurred to me that perhaps some of these musings, if put down in a sequential form, might interest others, and perhaps raise in them further thoughts and ideas. In all humility and in full appreciation of their crudity, the following themes of reflection are submitted.

I.

Like many other members of our Corps, I am constantly receiving circulars and catalogues from pharmaceutical firms indicating the latest therapeutic agents. Idly examining such a list, one has been impressed by the number of synthetic substances which are now available. The mere existence of these preparations raises a train of thought full of suggestion. Take any two for the sake of argument, such, for instance, as salicylic acid and adrenalin. The former exists in Nature, and is capable of being extracted from the buds of *Spiræa ulmaria;* the other is an extract from the suprarenal glands, remarkable for its power to increase blood-pressure. The articles submitted for sale are in neither case in the majority of instances so derived. The bulk of the salicylic acid and adrenalin is synthetically prepared; in the one case by saturation of sodium phenolate with carbon dioxide, and in the other, by the putting together of cleavage products derived from coal tar. The salicylic acid resulting from the interaction of carbon dioxide and sodium phenolate is identical in its therapeutic action with the same acid derived from the *Spiræa ulmaria.* Similarly, the adrenalin derived from coal tar has a physiological value equal to that of the natural product. Examples of this kind could be quoted almost indefinitely, such as camphor, a natural product from the leaves of the *Laurus camphora,* now capable

[1] Received for publication April 17, 1912.

of synthesis from the terpene basis; vanillin of the vanilla pod; indigo of the indigo plant; luteolin of the broom shrub; and apigenin of parsley; all capable of synthetic production from the anilines.

Here we have a series of artificial products absolutely identical in composition and attributes with the same products prepared by Nature in a variety of organic living tissues. As one sits and thinks of the situation, thoughts come rapidly. Are we to assume from these facts that the making of these various substances by Nature in living animal or vegetable tissue is nothing more than simple chemistry, or, in other words, advanced organic chemistry, that is a mechanical adherence to chemical and physical laws, represents the something we call life? There is much to suggest that such is the case, but there are difficulties.

Our first thought takes us back to a reflection as to what are the dominant characters of that which we call living matter or tissue. Forming a mental picture of any kind of living matter, we at once are capable of giving it such attributes as complexity, unstableness, irritability to stimuli, a definite form or appearance, an ability to display energy, and manifest both growth and function. We may next proceed to think out how far each of these characteristics of living matter is capable of explanation on a purely chemical conception. It is an interesting situation, and quite worth thinking over in an idle hour.

That a living tissue is both complex and unstable is not difficult to explain on a purely chemical basis. Every such tissue is composed largely of carbon and nitrogen. An elementary knowledge of organic chemistry recalls the absolutely bewildering combinations of the carbon atom, the benzene nucleus, and that other mysterious molecule $C_{10} H_{16}$ which is the foundation of so many living vegetal tissues. The curious instability or explosiveness of living matter is, from the same point of view, explicable by the dominant presence of the nitrogen atom, probably the most restless and changeable entity in Nature. Therefore, in respect of these two characters, a simple chemical analogy does not fail us. Again, if we take the two attributes of mere shape or form and responsiveness to stimuli we find that they are not the exclusive property of living matter. For instance, the sciences of crystallography and plasmology have demonstrated that many mineral forms artificially induced assume or present marvellous likenesses to the forms of amœbæ, radiolaria and the diatomaceæ. Similarly, just as animals and plants respond to a stimulus and become tired

or fatigued by over stimulation, so do the metals, and, what is equally extraordinary, metals are sensitive to depressant drugs and anæsthetics, losing under these influences for a time their irritability. These are all facts that suggest a doubt whether these particular attributes are vital functions, or rather functions common merely to matter.

When we come to think of the energy displayed by living matter, say such as is obviously generated in the living body by food, we find that experimentally the same energy, as measurable by a calorimeter, is manifested on combustion by dead matter. The same analogies present themselves when we think of the powers of growth and assimilation as presented by living matter. These analogies are largely chemical. Think for a moment of a bacteriological culture tube, the medium is immaterial, we introduce a germ and in a period of time the number of germs is uncountable. If we examined the contents of the tube, we should find that much carbon dioxide has been produced and a number of new chemical substances formed in the culture medium. Can we think of this as a mere chemical reaction? Undoubtedly, for the increase in number of germs is clearly due to a chemical interaction of the germs and the medium, and the original germ contained a something that reacted with the medium to reproduce itself and its offspring synchronous with a chemical disintegration of the medium. Our critical faculty here suggests that though the phenomena are associated with chemical reactions, these reactions do not explain the whole sequence of events, for had not the original germ been a *living* germ the resulting chemical reactions would not have followed. This is true, and our musings tell us that it is precisely at this point that the apparent analogy between what we call life and mere adherence to chemical laws breaks down.

The inherent workings of what we call living matter may and probably do follow chemical and physical laws—the detailed examples from synthetic chemistry clearly indicate it—but this chemical-law-abiding living matter does not consist of matter alone. There is something besides, something which is not matter. We are dimly conscious of it when we think of some functions of the higher forms of living matter, such as consciousness, feeling and even thought itself. To some, the explanation lies in the belief that feeling, thought, consciousness, &c., are but collateral products of physico-chemical processes going on in certain forms of living matter, just as the secretions are the products of analogous

processes in other forms of living matter. If we accept this, we cannot think of there being such a thing as life as a separate entity, but that man and all forms of living matter are mere automata. But we cannot accept it—it does not explain the prime fact that there should be two forms of matter, one living, one not living, nor even does it explain why or how there should be any matter at all.

A train of thought started by so prosaic an article as a pharmacist's drug list has suggested musings which culminate in that difficult question, is there such a thing as life, and if so, what is it? Our thoughts bring us to this conclusion, that all living matter is but a mechanism, functioning through chemical laws only; that if life be anything which interferes with those chemical laws, then its existence is unacceptable; that if life be that which resides in living matter, merely guiding or directing those chemical laws, but not interfering with them, then its existence cannot be denied. That this last conclusion is not far from the truth is supported by the thought that the surest means of demonstrating the existence of life in living matter is by interference with recognized physico-chemical laws associated with its activities. The activities of living matter are observable, just as those of electricity, magnetism, heat and other forces are; but we know no more of the real nature of life than we do of the nature of those forces. No matter how long we muse or how deeply we think of these things, we are compelled to assume some agency which can and does apply, direct, guide and co-ordinate a variety of forces. The rôle of that agency has been, and is, to build up that complex machine, living matter, which is not only self-repairing but self-renewing, self-multiplying, and self-adapting to an ever-changing environment. With that statement we are content to leave our musings as to the nature of life.

II.

An unobtrusive paragraph in an Indian daily paper arrested my attention one day by the statement that someone or other had stated that the inorganic constituents of blood plasma were identical with the composition of sea water, and that the one might be derived from the other. On first thought this seemed a far-fetched idea and based on wrong facts, but, on looking the facts up, one found that the relative proportions of sodium, potassium and calcium in the plasma of mammals are curiously similar to those existing in ordinary sea water. The sodium is absolutely

the same in both, the calcium very nearly so, while the potassium is 6·7 per thousand in one and 3·7 in the other. The most notable difference between the two liquids is the large proportion of magnesium in sea water as compared with a mere trace in mammal plasma. If our blood plasma had its primitive origin from the water of the oceans, then the sea water of our infant earth must have been very different, at least in respect of its contained magnesium, to what it is now. It is quite possible that it was very different. We know that the chloride of magnesium in a heated water is converted into an insoluble form of magnesia. Geology and astronomy both indicate that the earth in its early stages of formation must, and actually did, have a temperature far in excess of that with which we are familiar. The early oceans, therefore, must have been very hot, and in that condition incapable of holding any magnesium they received in solution. That is to say, the early ocean water was practically devoid of magnesium, and otherwise identical in composition with present-day blood plasma. The difficulty is to conceive the lineal relationship between the two. Assuming the primordial form of present-day mammals to have been not only very different from those of our day but also aquatic, the conception of a continuity in mineral constituents between the palæolithic seas and the blood plasma of forms evolutionized from the forms which inhabited those seas, is not difficult.

To many, the idea may seem fanciful, but there is some collateral evidence to support it. The elements contained in living forms are precisely the elements present not only in sea water but in the oldest rock formations. The most dominant inorganic element in all living tissues is potassium. It is a well-known fact that all the oldest rock formations yield on analysis a high potassium content. The earlier seas were probably fresh water oceans dissolving the soluble constituents of the earliest rocks. Add to this the fact that the atmosphere of the earlier periods of this world's life was heavily loaded with hydrocarbons and we get in that air, in the land of that era, and in the solvent water on that land all the essential inorganic elements of living matter. The suggestion is overwhelming that in the beginning of things there were in the then existing air, land and water all the elements of living matter and that somehow or other these elements did unite or combine actually to form living matter.

So far the line of thought has been comparatively easy, but we are now up against the great problem of all. How and by whom was this brought about? One has sat and thought for long

hours over this question. So have many others. As a step towards the answer, one must affirm that it is certainly very difficult to believe that there was a gap between the inorganic and organic evolutions. The real crux of the problem lies in the answer to another question, which is, was the sequence of events, covering unthinkable periods of time, an automatic process due to the inherent properties of the elements and in accordance with physical and chemical laws, or was there a Guide controlling the whole without interfering with physical and chemical laws? The mere fact that man has never succeeded in making living matter out of the non-living even when aided by and conforming to all physical and chemical laws, seems to be and is an insuperable objection to any idea that the sequence of events could have been brought about without a Guide. On the other hand, it is not inconsistent with our present advanced knowledge to suppose and admit or believe that there was a Guide who controlled the synthesis of living matter from the inorganic, and that without disturbing either its physics or its chemistry. With these thoughts, we can abandon further musings on the origin of life.

III.

A few weeks ago, while in church, I heard the following passage read as a part of the second lesson: "In the which the heavens shall pass away with a great noise, and the elements shall melt with fervent heat, the earth also and the works that are therein shall be burned up." (2 St. Peter iii, 10.) It may not be to my credit, but I confess that at the time the passage was not familiar to me. On thinking the matter over, certain trains of thought suggested themselves, the dominant one being that perhaps, after all, St. Peter had a greater prescience as to the disintegration of matter than some of us suspected, and that the outcome of some modern scientific work had a significance of more than material interest. The reader will supply readily the thread which connects the above quoted passage with the following considerations.

It is a matter of common knowledge that some twenty substances are known to emit certain strange rays, that is, are radio-active. The facts known concerning radio-activity further warrant the belief that the phenomena displayed by the various radio-active substances are the result of the decay or persistent disintegration of these substances. This decay of one substance is associated further with the production of other substances. With-

out access to technical literature, which is not available, one cannot be dogmatic on the point; but, writing more or less from memory, it may be affirmed that from uranium comes ionium, from it comes radium, and from it again comes helium, followed by an endless series of rays at present expressible only by alphabetical symbols. A similar sequence of events is known to result from actinium emanations, while from thorium comes meso-thorium, then radio-thorium and finally a series of thorium forms known only by symbols. Of course, the periods of time covered by these changes are variable and, in some stages, so vast as to be inexpressible by our numerals. Equally inconceivable to us is the energy evolved by and during these mutations, as the heat emitted by the single change of radium into helium is probably some three million times greater than that arising from any chemical action known to us.

Keeping our thoughts still on these radio-active substances, we know that while the radium emanations when dry turn into helium, they in the presence of water pass into neon and, if the water contains sulphate of copper, the radium not only becomes a third gas, namely argon, but the copper is changed into lithium and an amount of hydrogen evolved in excess of that which the water proportionately contains. To the thoughtful, the difficulty here arises, is this degradation of copper into lithium under the influence of radium rays an exceptional phenomenon, or is some analogous mutation happening also to other elements such as lead, carbon or sulphur? If the latter is the case, the energy in the form of heat emitted is inconceivable and the amount to be emitted, as this disintegration and mutation goes on, exceeds all our mental conception.

If our difficulties be great as arising out of what we know concerning the radio-active substances, they do not lessen as we think of the rays themselves. We hear of these as alpha, beta, gamma and delta rays, their sole difference being one of velocity. The first named are emitted from radio-active substances at a velocity of some fifteen thousand miles a second, and the energy which enables them to travel at this speed arises from the disintegration of the atoms of which they are a part. The true significance of this conception is emphasized when we realize that this emission of alpha rays is not an exclusive property of radium or of a few radio-active substances. To J. J. Thompson we owe the knowledge of the fact that, in the intense electrical field of a Crookes tube, non-radio-active substances give off two kinds

of particles charged with positive electricity. One kind is identical with the alpha rays of radio-active substances, the other kind is identical with the hydrogen atom. If we admit, as we are bound to do, that the alpha ray particles are the evidence and result of elemental decay, then, since they occur in and arise from ordinary matter, we are forced to admit that this elemental decay is not limited to the radio-active substances, but is universal. Has this been proved? Not absolutely, the difficulty apparently being that the velocity at which these alpha rays are emitted from ordinary matter is too low for them to affect or be recorded by any known apparatus. On the other hand, it is known that some of the elements in the radio-active series which are spectroscopically demonstrable stages in their mutations are at the same time apparently without rays. Therefore because all ordinary matter does not emit perceptibly these rays, we are not forced to conclude that it is not undergoing degradation or disintegrating, since there are certain known substances which are undoubtedly disintegrating and yet are rayless as far as we can perceive.

Transferring our thoughts to the delta rays, we find that they present data for serious reflection. These so-called delta rays are really secondary emanations which fly out from ordinary substances when the other radiations impinge on them. The velocity of these rays is apparently uniform, that is, they are independent of the impinging rays which cause them. This suggests that they are not particles torn off from matter by other particles striking it. If so, then what are they? We can only assume that they represent a further manifestation of the energy of the disintegration of matter. That this is a justifiable assumption is supported by the fact that if a piece of zinc and a piece of lead be respectively exposed to the same bombardment of X-rays, then twice as much heat is produced in the lead as in the zinc. In this case, there can be no question that the excess heat from the lead is due to some superabundant inherent store of energy in the atom, liberated as the result of the atom's disintegration under the bombardment of the rays impinging on it. If further doubt exists concerning the universal decomposition of matter it should be removed by the fact that Thompson has proved that the commonest substances all emit delta rays to a small but definite amount even when not bombarded by other rays. While to clinch the argument we are confronted with the fact that quite 1 per cent of the atmosphere is made up of the mysterious gases argon, neon, helium, krypton, and their like, which, from collateral evidence, are indisputable by-products of elemental decay.

Recent physical research, therefore, compels us to recognize that radio-activity is the very essence and manifestation of the disintegration of matter, that not only the gases of the earth but the very earth itself is radio-active ; finally, that as the result of this extended radio-activity of the earth and its elements, there is being evolved an amount of heat which is far in excess of that needed to equalize the earth's heat loss by radiation. It is true the processes are working slowly and, not unlikely, the cataclysm to be associated with their cumulative effects is remote, but the train of thought is legitimate which connects the minatory words of an Apostolic epistle with the plain teaching of modern research as to the possible final end of life.

SIMPLE TREPHINING FOR INCREASE OF INTRA-OCULAR TENSION.

By Major H. C. R. HIME.
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In ophthalmic circles there has been a good deal of controversy recently, on the question of the treatment of glaucoma by trephining, so that perhaps the following account of the operation of simple trephining for the reduction of increased tension in the eye, which was devised in August, 1909, by Lieutenant-Colonel R. H. Elliot, I.M.S., Superintendent of the Government Ophthalmic Hospital, Madras, may be of interest to some officers of the Corps. Through Lieutenant-Colonel Elliot's great kindness I have had opportunities of performing the operation many times, and of seeing it done on a very large number of cases.

As most of the symptoms and signs associated with a rise of intra-ocular tension are due to the actual increase of tension, the treatment of the condition practically resolves itself into finding and adopting the best method of reducing the tension, and this is the object which Colonel Elliot had in view when he thought out this operation. The operation was suggested as an alternative to those which were already in use for the treatment of this condition as it has the great advantage of simplicity in addition to being most effective in lowering the tension. Trephining has also been successfully employed in cases of staphyloma, a condition in which there is a disproportion between the intra-ocular tension and the strength or resistance of the tunics of the eye. In all cases the staphylomata have rapidly undergone temporary reduction in size, and in most the reduction has remained permanent.

Briefly stated, the operation consists of removing a small disc of the tunics of the eyeball by trephining the corneo-scleral junction, and the object of the operation is to secure reduction of the tension by allowing the aqueous fluid to filter through the trephine-hole and escape under the conjunctiva, where it is rapidly absorbed. The chief feature of Elliot's operation as distinguished from that of others, is that the trephining is done directly into the anterior chamber, well in front of the ciliary body.

It is not my intention to enter into the various causes of increased tension, but no matter what the causes may be, it is certain that, with some obvious exceptions, reduction of tension, relief and perhaps cure will probably be obtained.

The average normal tension of an eye, when taken by means of a Schiötz's tenometer (the one now exclusively used in Colonel Elliot's clinic) is said to be between 20 and 25 mm. Hg., whilst that of an eye with increased tension may be anything up to close upon 100 mm. Hg. The tension after successful trephining averages between 10 and 15 mm. Hg., and remains at that as long as the patient stays under observation in hospital, usually about ten days. Of the cases which there has been an opportunity of examining some months (up to $2\frac{1}{2}$ years) after operation the tension, in a very large percentage, has still been found to be low, and in most of the cases, except those beyond hope, or where some complication such as cataract has supervened, the vision has improved. As an example of the way tension remains low and vision may improve, mention may be made of two return cases which happen to be in hospital just now for the extraction of cataract. One case I trephined on March 11, 1911, when the tension was 72 mm. Hg.; on June 25, 1912, the tension was 17 mm. Hg. before the extraction of the cataract. The other case, which was trephined on August 25, 1910, when the vision in the right eye was $\frac{6}{36}$, had on June 28, 1912, vision of $\frac{6}{18}$ in that eye (only the left lens is cataractous). The hospital records show many similar and perhaps even more striking examples. In addition to reduction of tension, the more immediate results of the operation in cases of acute congestive glaucoma are loss of pain, rapid reduction of congestion, clearing of the media and improvement of vision, whilst in chronic cases the recurrence of pain and of acute attacks is prevented.

The operation of trephining may be performed during an acute congestive attack of glaucoma, or at any other time, and either one or both eyes may be trephined at the same operation, in fact, in cases where both eyes are affected, the practice is to trephine the two eyes on the same occasion.

The following is a description of the preparation of the patient and of the operative technique employed at the Government Ophthalmic Hospital, Madras. As the preparation of the patient for operation is a matter of such very great importance, the procedure adopted has been given, as it may be of interest and perhaps be found useful.

Preparation of the Patient.

In *acute congestive cases*, on the evening before operation, eserine solution (gr. ii. to ℥j) is instilled into the eye, a saline purge administered and a dose of morphia given to relieve pain,

quiet the nerves, and secure a good night's rest. In *chronic cases*, if there is any pathological condition of the conjunctiva this is treated until cured. On the afternoon of the day before operation the patient's eye is thoroughly irrigated with saline solution (1·4 per cent, isotonic to tears), eserine solution instilled, a "trial-pad" and bandage applied and, in the evening, a saline purge is administered. On the morning of operation the "trial pad" is removed and if there is no discharge, or only a small quantity, the patient is brought up for operation; but if the discharge is moderately copious or purulent, the case is put back for further treatment of the conjunctival condition.

Having been prepared for operation, the patient's eyelashes are cut close, and his cheek, eyelids and forehead are washed with cyllin soap, after which his conjunctival sac is well douched for two minutes with perchloride of mercury solution (1 in 3,000). Shortly before operation two drops of cocaine solution (4 per cent) are instilled four times at intervals of two or three minutes, the last instillation taking place when the patient is on the operating table. The next step, which is carried out when the patient is on the table, consists in swabbing out the upper and lower fornices of the conjunctival sac under a stream of saline solution (1·4 per cent), by means of small pads of wool on the end of thin strips of bamboo. The swab is inserted under the lid and pressed well into the fornix, and swept across from the outer to the inner side of the eye. By this manœuvre a large quantity of mucus is removed, and the use of the swabs is continued until, on feeling them, they are found to be free from mucus. After this the margins of the eyelids are very firmly pressed together between the fingers and thumb of the operator, to remove as much as possible of the sebaceous matter from the ducts of the meibomian glands. The speculum is now inserted, care being taken not to soil it on the edges of the lid in doing so, and, whilst the lids are raised from the globe by means of it, the sac is again irrigated with saline solution.

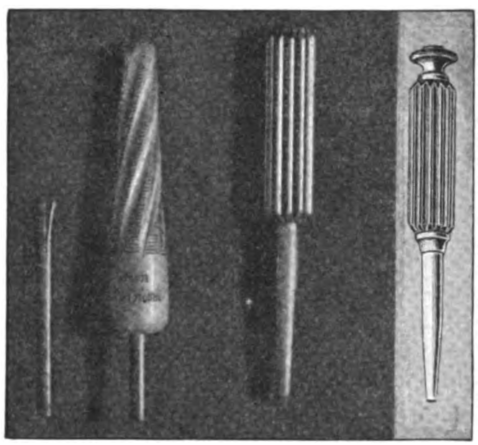
The washing out of the conjunctival sac with perchloride solution of the strength used causes a good deal of redness of the eye, with desquamation of epithelium and secretion of mucus, but there is an advantage in the two latter points, in that organisms which may be deeply seated in the conjunctiva are extruded at the time of desquamation and secretion.

For irrigating the conjunctiva, a vessel of aluminium, like a small teapot with a long spout of small calibre, is used.

If the eye is markedly congested, and considerable hæmorrhage is anticipated, a sub-conjunctival injection of adrenalin solution (1 in 3,000) may be given, as free bleeding, by obstructing the view, very materially adds to the difficulty of the operation. At the same time this injection should be used as seldom as possible, as it appears to cause a shrinking and rolling up of the conjunctival flap, which interferes with the subsequent replacement.

Operation.

The following instruments are required for the operation: Speculum, trephine, fixation forceps, iridectomy scissors, iris forceps, repositor.



(a) (b) (c)

Fig. 1.

McKeown's irrigator may be found very useful. It should contain saline solution (7 per cent, isotonic to aqueous fluid). A large variety of trephines are obtainable, but at the Madras Hospital, Sydney Stephenson's, or Elliot's modification of Stephenson's trephine, is almost invariably used; the diameter of the cutting edge is 2 mm. A full description of Sydney Stephenson's trephine need not be given, but one might mention that it is made of one piece of hollow metal about 5 c.c. long. It consists of an upper part, a thick, cylindrical and vertically ribbed head or handle, and a lower thin smooth blade, the lower end of which is sharpened into a cutting edge. Stephenson has another trephine similar to

the above but with removable blades, the blades being fixed by a screw through the top of the handle (fig. 1 (*b*) (*c*)).

Colonel Elliot's modification of Stephenson's trephine consists in having the handle conical, with the apex of the cone upwards, and the fluting arranged spirally with the edges of the fluting serrated at right angles to its length; also the blade is only half the length of that of the above trephine. The blades, which are removable, are made of steel tubing; the upper end of the blade is divided into three parts which open to form a spring; when inserted into the handle they hold it firmly (fig. 1 (*a*)). The shape of the handle and arrangement of the fluting is a great advantage, in that it lessens the tendency of the fingers to slip down when the instrument is in use. The reduction in length of the blade brings the fingers nearer to the eye, and so it is easier to keep the instrument steady when using it.

The instruments required are sterilized in the usual way by boiling for half an hour.

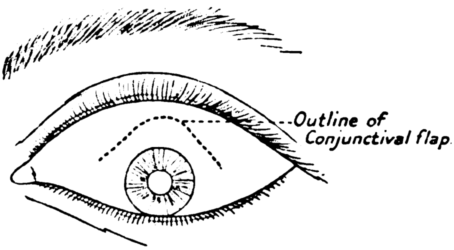


FIG. 2.

Site of Operation.—The most suitable site for trephining is above the cornea, as the wound is practically always covered by the upper lid and so is less exposed, and, consequently, less liable to infection. In addition, if an iridectomy is performed, it will cause less inconvenience in this position than at any other. In some cases, such as where the patient persists in looking upwards, the operation may be performed below, and when the eye is staphylomatous, the most healthy meridian must be selected. When trephining is done for the relief of pain, &c., in a blind eye, any situation most convenient to the surgeon may be selected, but that above the cornea is preferable.

The Conjunctival Flap.—The first step of the operation consists in dissecting up a conjunctival flap. If it has been decided to trephine "above," the patient is directed to look down, and the

conjunctiva is seized with fixation forceps as high up as is conveniently possible (about ½ in. above the cornea). The conjunctiva is lifted off the globe, and a snip made with scissors through the apex of the piece thus raised, and then by inserting one blade of the scissors as far as possible into this opening, a cut is made on either side concentric with the cornea, and carried down about 3 mm. below its highest part. Then, with a few more snips, a semi-circular flap is dissected down, nearly to the cornea.

The base of this flap should be greater than the maximum diameter of the cornea, so that a bridge of undisturbed conjunctiva at least 4 mm. wide, is left on either side of it (fig. 2). This is a matter of importance from the filtration point of view, and will be alluded to later.

It is advisable to make the first three cuts with the scissors quickly, for it is not easy to get the patient to continue looking down for any length of time. While dissecting up the conjunctiva it must be very gently held with the forceps as it is easily torn or button-holed, a thing which should be carefully avoided. Now turn the flap down over the cornea and hold it there by pressing upon it with the closed fixation forceps and proceed to separate it from the corneo-scleral junction. The dissection is carried actually on to the cornea, the conjunctival layer of which is stripped up for a space of about 1·5 mm.: the extension on to the cornea is one of the features of Elliot's operation. This part of the operation is most effectively done by means of a Bowman's needle or other similar instrument, or by scratching or tearing through the fibres with the point of the closed scissors, and the dissection should be continued until a purplish, semi-translucent crescent, about 1·5 mm. broad, is obtained, which indicates that one is off the sclera and between the layers of the cornea. This appearance is quite characteristic and once it has been seen cannot be mistaken. In congested eyes, during this stage, bleeding sometimes causes inconvenience by obscuring the view, but the application of a swab soaked in adrenalin solution (1 in 1,000) will usually control it, or as already mentioned a conjunctival injection of this solution may be employed beforehand.

Trephining.—Having completed the dissection of this conjunctival flap, the next step is the trephining. Whilst drawing down the flap with the closed forceps, apply the trephine as close up as possible to the attached margin of the flap, or in other words, as far on the cornea as one can—Elliot's idea being that at least half the area of the disc should be of corneal tissue (fig. 3); now rotate the trephine, applying light pressure, until the disc is cut out. The

method of holding the trephine is a matter of experience and personal idiosyncrasy. Some hold it between the thumb, middle and index fingers, but I find the most convenient way to be between the thumb and middle finger, with the index finger on top. It is quite easy to rotate the trephine between the thumb and middle finger and at the same time apply the necessary pressure with the index finger. A difficulty arises from the fact that one's fingers tend to slip down the trephine, but when held in the above way I think this tendency is more easily overcome. With Elliot's trephine this inconvenience is much less marked owing to the handle being conical in shape.

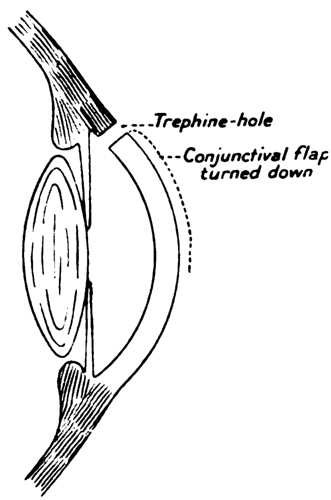


FIG. 3.

Once the trephine is in place the conjunctival flap may be left to take care of itself or be held down by an assistant, and the forceps may now, with great advantage, be employed to steady the lower end of the trephine, by placing a blade on either side of its shank. A point to bear in mind is that the trephine must be kept perpendicular to the surface or, in place of the disc being cut out clean, it will be found that only part of its circumference has been cut through ; this will give rise to a little difficulty later on.

The amount of pressure to be applied with the trephine can be learnt only by experience, and at first one is surprised to find how much force it is necessary to use to cut through the tunics. Until

one has acquired sufficient experience to know when the trephine has cut through, one should lift it up now and again to see how the trephining is going on. There is not the least difficulty in slipping it back into the groove that has already been made, and for this reason it is well not to lift the instrument for the first time, until a fairly deep groove has been cut. With experience one can often feel a kind of sucking sensation when the trephine is through, and again aqueous may escape, also the patient will frequently give warning by an exclamation of mild pain.

During the trephining the disc may be cut out quite clean, but as a matter of fact it will usually be found adherent at some spot by a few tags of tissue. This is dealt with by catching hold of the disc with a pair of iris forceps and cutting through the restraining fibres with scissors *in* the wound. It is important that the cutting should be done *in* the wound and not outside it on a level with the outer layers of the sclerotic, for otherwise some of the deeper layers of the disc will be left behind and will partially block up the trephine hole.

In most cases, on removing the trephine the iris will bulge into the wound, and on incising or excising the bulging portion with fine scissors aqueous will escape freely and the anterior chamber becomes empty. It is better to excise a small piece of the iris, rather than merely to incise it, for by so doing no iris remains immediately behind the trephine-hole; when the iris is simply incised, it has occasionally been found next day to have become prolapsed through the hole, blocking it up, and preventing filtration. Unless the iris bulges into the wound it is not interfered with in any way. After excising the piece of iris, if its edges do not go back, they may be replaced by a repositor, or what is much better, may be washed back by means of an irrigator. With a little practice the attached disc and a portion of the protruding iris may be removed by the same cut with the scissors, and really it is an advantage to do so. When excising the iris, if it is dragged upon in the very least, more will protrude, which may lead to its impaction in the wound, and also a much larger iridectomy than is necessary has to be done. But if the iris and disc are taken together in the forceps, the disc supplies a point of fixation or resistance and prevents dragging on the iris, and, on cutting the two together, a small iridectomy can easily be done.

The last step of the operation consists in turning the conjunctival flap back into position with a repositor, closing the eye and applying a pad and bandage to both eyes. When the operation is

performed above, it is very rarely necessary to use a stitch to keep the flap in position, as this is done by the upper lid ; but when some other site has been selected, it is generally advisable to put in one or two, as the flap is liable to become doubled up and interfere with the escape of fluid.

After Course.—The eye is inspected twenty-four hours after the operation, when, if it has been successful, the tension, as taken digitally, should be low, the anterior chamber reformed, the pupil central, and filtration of fluid through the trephine hole free, as evidenced by œdema of the flap. Atropine solution is now instilled with a view to preventing adhesions between the iris and lens, due to a quiet iritis which sometimes occurs. The eye which has not been operated upon is now released from the bandage, and the eye which has been trephined is released on the third or fourth day after operation. The patient is usually discharged from hospital on the tenth day.

Elliot's object in trephining so far forward on the cornea is to ensure entering the anterior division of the aqueous chamber and to avoid the ciliary body—the idea being that the uveal tract should be left completely alone unless it is necessary to perform an iridectomy on the protruding iris. In many old-standing cases of high tension the lens and iris attachment are pushed forward and consequently, if the trephining is not done well forward on the cornea the opening may be made into the posterior division of the aqueous chamber.

It may be asked, "Why is such a large conjunctival flap necessary?" One reason is that a large flap forms a better protection against the subsequent entry of septic infection, and another, that it is advisable to have as large a filtering area as possible. The flap when replaced usually becomes united by its edges to the surrounding conjunctiva, but occasionally the edges appear to become turned in and to become firmly adherent to the sclera instead. When this occurs, the filtering area for the fluid from the anterior chamber is restricted, and if it were not for the large size of the flap, and for the passage of communication with the general subconjunctival tissue left on either side of the cornea, it would hardly be possible for the fluid to escape and be disposed of (see fig. 1).

With regard to the size of the trephine, it may be mentioned that in the early days of this operation, trephines varying in diameter from 1 mm. to 3 mm. were used. With the small size difficulty was found in dealing effectively with the iris, whilst with

the larger size there was a considerable tendency to prolapse of the iris after the operation. The trephines which are now used have, as already stated, a diameter of 2 mm.

It might, perhaps, be well to allude briefly to some of the complications which may occur at the time of operation and just subsequently :—

(1) Buttonholing or tearing of the conjunctival flap may occur whilst it is being dissected up. If the lesion occurs over the trephine-hole it may, as it heals, become united to the edges of the hole, blocking it up and interfering with filtration. The flap should be extended laterally so that the trephining may be done at a spot which can be covered by uninjured conjunctiva, or another site may be selected.

(2) Hæmorrhage may occur to such an extent that the anterior chamber becomes filled with blood. This can usually be removed with an irrigator, but if, after a fair trial, it is not successful, it is better to leave it alone, as the blood will soon be absorbed.

(3) The disc cut out may be carried before the trephine into the anterior chamber. On the rare occasions on which this does happen, it may be possible to wash it into the hole by irrigation, when it may be seized with forceps and removed—but beyond this it is unwise, and unnecessary, to go. The disc in the anterior chamber does not appear to cause irritation, or to do other harm.

(4) In some cases, after trephining and excising a portion of the iris, and the escape of a small quantity of fluid, the eye remains hard and the anterior division of the aqueous chamber full. The explanation of this condition appears to be that it is only the posterior division of the aqueous chamber which has been opened, owing to the attachment of the iris being very far forward. On the escape of the fluid from this chamber, the pressure in the vitreous chamber pushes the lens forward, and that in the anterior division of the aqueous chamber pushes the iris back, with the result that the posterior division of the aqueous chamber is obliterated ; and the iris, being pressed tightly against the lens, prevents the escape of fluid from the anterior division of the aqueous chamber. The result is that the eye remains hard. It is better not to interfere with these cases, for it is usually found that within about twenty-four hours the tension has gone down, due, no doubt, to the fact that the posterior division of the aqueous chamber has become reformed, with a resulting establishment of communication with the anterior division, followed by filtration through the trephine-hole.

(5) Another class of case occasionally met with is that in which after trephining there is a free escape of fluid, with complete obliteration of the aqueous chamber and lowering of tension, but the eye in a few seconds becomes hard again. This is probably due to intra-ocular hæmorrhage and nothing can be done. The tension of the eye will soon fall, as blood in this position is rapidly absorbed.

(6) Escape of vitreous and injury to the lens are rare and usually occur only in very old-standing cases when the trephining has been done too far back. When they do happen all that can be done is to replace the conjunctival flap and close the eye.

(7) Prolapse of the iris into the trephine-hole may be noticed twenty-four hours after operation. The conjunctival flap must be turned down and the protruding iris excised.

(8) The conjunctival flap may become displaced during the first twenty-four hours. If it does, put it back into place and apply a couple of stitches under cocaine—quite a simple and effective procedure.

(9) Sub-acute iritis occasionally develops. It should be treated by atropine, leeches and the other usual remedies. The quiet iritis which sometimes sets in has been already alluded to.

This description being rather long may, perhaps, convey the impression that Elliot's operation is somewhat complicated and difficult but, in reality, it is not so, for the whole operation from beginning to end only takes seven or eight minutes. It may be thought that the details are unnecessarily minute, but they have been made so specially, with a view to being of use to those who have not had an opportunity of seeing the operation performed but would like to try it. In conclusion, I would add that Colonel Elliot is only too pleased to see officers of the Corps, and anyone interested in the subject of ophthalmology could not do better than spend a month or two in Madras, where an enormous amount of material is available in one of the best equipped hospitals in the world. Every possible assistance and encouragement is given, and every facility is placed in one's way to acquire a thorough knowledge of operative and clinical ophthalmology.

PREVENTION OF MALARIA AT HYDERABAD, SIND.[1]

By Major H. HERRICK.

Royal Army Medical Corps.

THE following account of antimalarial measures undertaken during the year 1911, at Hyderabad, Sind, may be of interest to the casual reader of the Journal, and probably will be of special interest to officers who have been stationed there in former years.

The Cantonment of Hyderabad, Sind, is situated on a plateau about 30 ft. above the level of the surrounding country and[2] 134 ft. above sea level, in lat. 25° N., and long. 63° E. and about two miles from the Indus.

The plateau is composed chiefly of gravel and sand, with patches of clay; the surrounding country is mostly alluvial, flat, and cultivated where the soil is favourable. The low-lying country was flooded in former years by the annual rise of the Indus, which filled the irrigation canals and caused them to overflow their banks. This is most important from the point of view of antimalarial measures.

Climate.—There is a cold and a hot season. The former, lasting from November to February, has an average shade temperature ranging from 75° to 45°. The hot season, from March to October, is very trying; the temperature during the hottest months ranges from 110° F. to 115° F. and occasionally reaches a maximum of 120° F. in the shade.

The prevailing winds are from the south or south-west in the wet season, and from the north or north-east in the cold season.

Rainfall.—The annual rainfall is very slight, usually only a few inches.

City.—The native city and sudder bazaar are to the north and north-east of the cantonments, and about half a mile distant.

Water Supply.—The drinking water is taken from the Indus at Gidu Bandar, which is on the left bank of the river opposite Kotri. The supply comes to Hyderabad in a masonry aqueduct and is supplied to the cantonments from water-towers.

The water for irrigation purposes is supplied from canals which take off from the Fuleli Canal, the Fuleli taking off from the Indus

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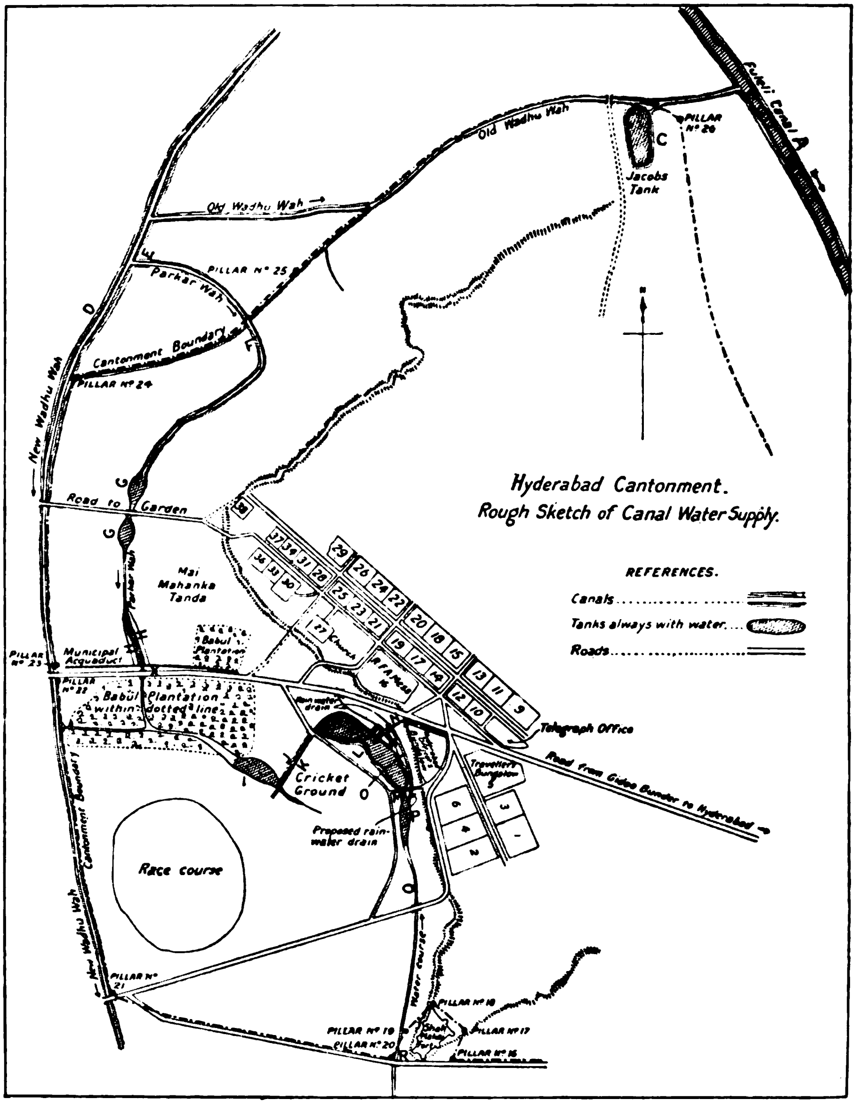
[1] Received for publication April 17, 1912.

[2] Authority, Intelligence Branch of the Division of the Chief of the Staff.

a few miles above Kotri. The Fuleli Canal is marked "A" on the map.



The New Wadhu Wah is the main canal at the west of cantonments; the old Wadhu Wah takes off from it, as shown on the map, and irrigates all the north of cantonments.

The Parkar Wah Canal takes off from the Wadhu Wah at the

sluice marked "E" on the map, and is the main irrigation canal to the west of cantonments. This canal, when allowed to overflow, filled up tanks marked "G" and "I" on the map.

Another canal, which is outside cantonment limits, took off from the New Wadhu Wah at boundary pillar No. 21 and flowed parallel to the road to boundary pillar No. 20, where there was a sluice marked "R" on the map, which was supposed to regulate the flow of water into the watercourse leading to tanks "P" and "L."

The ground to west of the above mentioned watercourse was irrigated by lifting the water by means of Persian wheels. Tanks "G" and "I" could also communicate with tanks "L" and "P."

The annual rise of the Indus is due to the melting of the snow at its source, and at the sources of its tributaries, and by the end of June, or beginning of July, the Indus, at Kotri, is in full flood, and the canals are rapidly filling, and by August in former years the west and south parts of the cantonment were one vast jheel, which, when partially dried, made an excellent breeding-place for mosquitoes. This was the state of affairs when I arrived at Hyderabad in September, 1909, for temporary duty, and also in November, 1910, when I was permanently transferred to the station. All the tanks were full, and most of the ground under water, and everywhere mosquitoes were breeding.

Nothing much could be done in 1910 as the canals had overflowed; so I had to turn my attention to what could be done next year to get rid of the water already in the tanks, to fill up these tanks, and to prevent more water getting in.

When I first suggested cutting off the water through the Parkar Wah Canal there was an outcry that the cantonment would lose revenue from stoppage of cultivation, and from the diminished sale of lac from the babul trees in the plantation to the west of the cantonment.

The first difficulty was got over by repairing sluice "E" and making the cantonment superintendent responsible for the supply to the cultivators, so that only a sufficient amount of water should be let in, and no more. By these means water was never left standing more than twenty-four hours in the irrigation channels.

As to the babul trees—a forest officer was consulted and gave as his opinion that once every two years was sufficient to water the plantations. So both these obstacles were surmounted.

The Parkar Wah was bunded at X, this stopped the water getting into tank "I." A bund was also put at the upper end of

tank "L" where it adjoins the road. The next step was to get rid of the water from tanks "L" and "P," and try to prevent them filling again. These tanks were the main breeding-grounds for anopheles mosquitoes, and were in close proximity to a highly infected native population.

The soldiers from barracks used to spend a great portion of their evenings fishing in these tanks, and I am certain that many men became infected while so occupied.

FIG. 1.—Tank "P." after completion of work. The water went beyond the trees. All the light portions of picture were formerly under water.

The Hyderabad Gymkhana Club and the Royal Field Artillery officers' mess were always full of mosquitoes in the evening, and bungalow No. 6 on the map went by the name of "Fever Hall." Bungalow No. 5, "the dak bungalow," was full of anopheles mosquitoes, and my wife and I got infected there shortly after our arrival at the station.

I was sitting one evening by the bank of tank "L" telling my troubles and propositions to a civil engineer, when the thought struck us, why not grade the banks of these tanks so that the flow instead of being from the south, as shown by arrow on the map,

should be from the north-west? Acting on this idea I ordered the sluice at "R" to be closed and kept closed, so that no water could get in, and then the filling of tank "P" was commenced, using jail labour.

We had many checks. First by being flooded by water from the municipal aqueduct, and again by the sluice at "R" being opened, by whom I could never find out. The sluice "R" was

FIG. 2.—Tank "L.," looking south, before grading and draining.

again closed, and a bund put there as well to absolutely put a stop to any more "regrettable incidents." The grading and filling of tank "P" was now continued, and in about twenty-seven days it was reduced to a narrow channel about 6 ft. wide with a fall to the south. I regret I did not take a photograph of this tank before commencing work, but give one of the tank after the filling was completed. In this photograph the channel is well shown.

Tank "L" was next attacked. In addition to jail labour we

were permitted by Lieutenant-General H. C. Slater, C.B., commanding 4th Quetta Division (who always gave us valuable assistance in all antimalarial and other sanitary measures), to employ the men of the detachment 1st York and Lancaster Regiment and of the 10th Jats, the European troops working two days a week in the mornings, and the Indian troops working four days a week in the evenings. They all worked with a will, so much so that, after eighty-one days' labour, tank "L," the Beyla tank of Hyderabad, was dry, and one of the show spots for a general

Fig. 3.—Tank "L.," after grading and filling, looking south.

inspection was gone for ever. I give photographs showing this tank both before and after filling. The first shows the tank used as a swimming bath, and the second shows the tank dry. As matters now stand all the tanks that are shown on the map as "holding water always," and consequently breeding mosquitoes, are dry. If water gets into tank "L" from an exceptionally high Indus, all that will have to be done will be to open the sluice at "M" and the water will flow south, and can be lifted by Persian wheels, which were previously used for irrigation, and the place will be left dry in less than a week. Various estimates were put in by experts for the

work of filling the tank or for getting rid of the water otherwise. I heard sums from 1½ to 2½ lakhs of rupees mentioned. That the water should be drained back to the Indus, by means of locks, was another wild suggestion.

The Hyderabad Cantonment Committee were able to do the work for 1,500 rupees.

Hyderabad, Sind, had never been considered a health resort, but its evil reputation was almost entirely due to the incidence of malaria. The following table will give an estimate of the sickness generally.

	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911
Average annual strength	390	458	483	497	494	411	492	488	443	523	556
Admissions—all causes	479	610	526	393	474	550	516	586	411	418	282
Ratio per 1,000, average strength, all causes	1,228	1,311	1,089	790	959	1,338	1,049	1,201	928	799	507
Average constantly sick—all causes	26·34	27·5	29·92	27·34	28·24	20·79	19·16	19·94	16·48	18·75	14·11
Admissions for malaria	183	164	214	114	69	274	300	299	177	165	84
Malarial ratio per 1,000 average annual strength	469·2	358·1	443·1	229·3	139·6	666·6	609·7	612·7	399·5	315·4	151
Average constantly sick—malaria	6·28	3·71	6·13	4·73	2·38	5·21	8·04	7·60	5·11	7·03	2·74

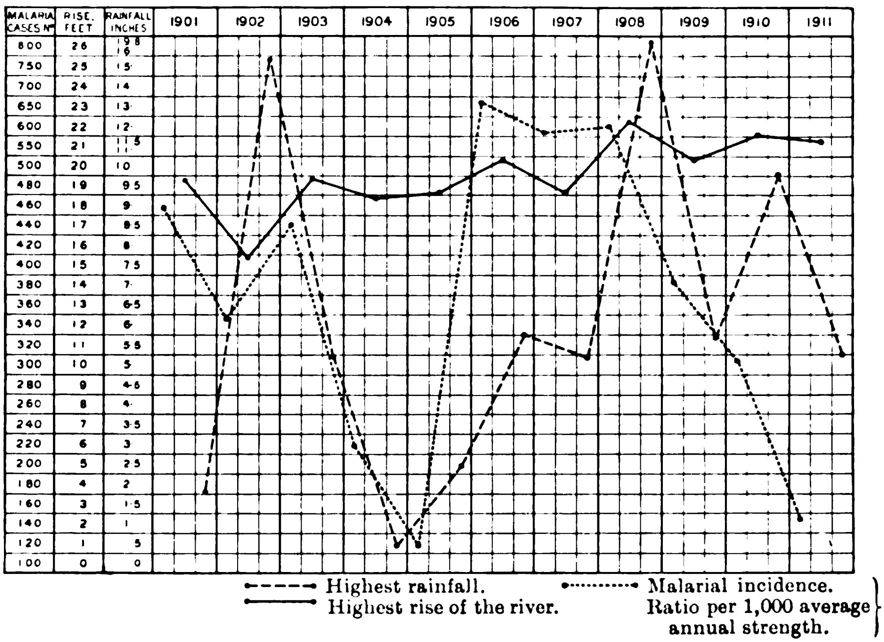
Remarks.—1905 was the first year in which men were treated in barracks.

In 1910 there was an apparent increase in the average constantly sick from malaria; this was due to keeping men suffering from benign tertian in hospital for ten days after the temperature became normal, and malignant tertian cases till all parasites had disappeared from the peripheral blood.

The rainfall at Hyderabad does not appear to have any influence on the incidence of malaria, but the rise of the River Indus distinctly *has*, especially in some years, as can be seen from the attached chart. A high river means bursting of bunds and much flooding. This was most marked in the years 1901, 1903, 1906, 1907, and 1908.

Probably the large number of admissions for malaria in 1906

was due to two units arriving from very malarious stations, the 32nd Battery R.F.A. from Deesa, and a detachment 1st South Wales Borderers from Mian Meer, and also to an exceptionally high flood in the Indus, which inundated the surrounding country and left many breeding-places for mosquitoes.



When the fundamental work of getting rid of mosquito breeding-places in cantonments was completed, we turned our attention to getting rid of adult mosquitoes in the houses, and began on the old huts in the Indian infantry lines, which were about to be demolished prior to the erection of new barracks. These huts were of mud, with *kutcha* roofs, smoke blackened inside—an ideal hiding-place for mosquitoes. Sulphur was used to fumigate them, 2 lb. being burnt for each 1,000 cubic feet of space. This must have killed all the mosquitoes, as, previous to fumigation, larvæ were constantly found in puddles left by workmen in the lines, but after fumigation larvæ were never found. The *débris* from the old huts was used to fill in hollows and level the ground in the vicinity of barracks. Levels were taken, and the work done in a scientific manner. The new barracks, Indian infantry lines, were then fumigated, and lastly the British troops barracks.

These British barracks, seven (7) in number, are very large rooms, each having a capacity of 100,000 cubic feet, and three large ventilators in the roof, besides many doors and clerestory windows. The ventilators in the roof were covered with tents, the doors and the clerestory windows closed and made as air-tight as possible by pasting brown paper over the chinks. The same amount of sulphur was used—i.e., 2 lb. per 1,000 cubic feet, and three hours allowed for fumigation. Everything living in the rooms was killed, including insects, birds and reptiles.

Prophylactic Issue of Quinine.—As many adverse opinions have been expressed as to the value of quinine as a prophylactic, I determined to give it a fair trial, but, owing to the stringent orders in the 4th Division about the issue of quinine to all men, I was unable to leave any men as a "control," hence the value of the trial is largely negatived.

Fifteen grains of quinine were given on two consecutive days to all European troops, commencing early in July. The quinine was given in solution with dilute nitro-hydrochloric acid, which is a valuable liver stimulant. After about a month I stopped the nitro-hydrochloric acid and gave dilute hydrochloric acid, which does not upset the digestion (as the other dilute mineral acids do), and hastens absorption.

The quinine was given between breakfast and dinner, usually about 11 a.m., and always under the close supervision of an officer, Royal Army Medical Corps. I mentioned my method of giving the prophylactic quinine to the P.M.O. 4th Quetta Division, Colonel W. G. Macpherson, when he made his inspection at Hyderabad on August 10, 1911, and he evidently found this method of administration with hydrochloric acid useful as he issued a circular letter on the subject, dated Quetta, September 22, 1911, saying "that when salts of quinine are given prophylactically. . . . they must be dissolved by hydrochloric acid in very dilute solutions."

To be of any use, quinine (given as a prophylactic) must be commenced some months before an epidemic is expected, given in sufficient doses, and under careful supervision, care being taken that no man escapes.

The followers, syces, &c., were also given quinine as a prophylactic by a sub-assistant surgeon attached to one of the Royal Field Artillery units.

Quinine was also given to all officers' servants and their families in cantonments; the drug was taken round and administered by men of the cantonment mosquito brigade, under an Indian N.C.O.

To malarial patients in hospital quinine was given in 10-gr. doses, if possible two hours before an anticipated attack in benign tertian cases, and then after the temperature became normal in 5-gr. doses, three times a day, for ten days.

In malignant tertian cases 10-gr. doses were given two or three times a day according to the severity of the attack. The after-treatment of malarial cases was carried on for four months. Each man on admission with malaria was given a malaria case-sheet, a copy of which is attached; and on this sheet was entered the total amount of quinine given. When a man was transferred the malaria case-sheet went with him to ensure continued treatment. Ten grains of quinine daily was the dose given in the after-treatment of an attack, and, if a relapse occurred, the fact was noted on the sheet in red ink, and the patient began anew his four months' curative course. A register by units was also kept in hospital, in which was noted the daily attendance of the men undergoing continued treatment.

Acid hydrochloride of quinine was the salt always given in hospital and quinine sulphate to those attending hospital.

A good deal of the above plan of treatment may be well known to officers who have served in the 4th Quetta Division, but I give it for the benefit of those who have not been so fortunately situated. All cases undergoing treatment in barracks were segregated as far as possible, but as the Government has not yet seen fit to provide men with mosquito nets, the isolation of men, except in those units which provided nets out of regimental funds, was merely nominal.

A step forward has at last been made, as, by an Indian Army Order just published, I see that units can purchase nets for Rs. 3·2 from the Army Clothing Department. The size of the net is 6 ft. 6 in. by 3 ft. 6 in. by 4 ft. I only hope that the net will be made without an opening in the side.

One corps only at Hyderabad, namely, the detachment 1st York and Lancaster Regiment, provided the men with nets, but as they had not got these nets in September and October, 1910, they were heavily infected. The Artillery Brigade arrived from South Africa after the season of greatest prevalence of mosquitoes, and was not so severely infected.

Nets are provided in hospital for all men suffering from malaria, and the malaria ward is also screened by gauze doors, and all windows are covered with wire gauze; in the hot season when punkahs are in use the nets can be removed. I have recommended that if the malaria at Hyderabad continues, the barrack rooms

be screened, but I think the cost will be prohibitive. Failing this I recommended that a portion of the verandah of each barrack room should be made mosquito proof with wire gauze, to segregate all men undergoing their four months' treatment.

The average monthly incidence of malaria for the last nine years, as well as for 1911, is shown in the following table :—

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Average last 9 years	17·1	4·0	8·11	11·44	12·0	10·44	9·77	9·88	11·66	18·88	43·0	37·77
1911 ..	12	8	6	11	17	11	2	2	4	5	3	3

This table shows that, in previous years, the last three months of the year accounted for the greater number of the annual admissions for malaria, that is just after the breeding season of the anophelines, with probable fatigue and cold as an exciting cause. An alternative theory to the above, which I give for what it is worth, is that when the wind changes to the north or north-east, which it does in November or December, the infected mosquitoes get blown into the lines from the city and sudder bazaar. Again a slight rise in the number of malarial attacks is seen on the commencement of the hot weather, which may be due to the awakening of infected hibernating mosquitoes, or the onset of the warm weather may be the encouraging factor.

Relapses.—Relapses, I take it, are due to a decrease in the germicidal power of the blood, or to a diminution in antitoxic power to a toxin which is produced by the malarial parasite. Relapses always occurred in the weakest men who never played games, and did little else than loaf around barracks.

I examined 108 malaria case-sheets, and found a record of relapses in 33, or 30·55 per cent.; every slight rise of temperature was taken as a relapse, even when a man was only detained for an afternoon, and a blood examination was always made. In only nine cases out of 108, or 8·33 per cent., was the blood of a patient with a relapse found to contain parasites—out of those nine cases in which parasites were found, eight were malignant tertian, one was benign tertian.

The average time of apyrexia in malignant tertian cases which relapsed under treatment was twenty-eight days, though in one case the apyrexia was as short as fourteen days, and in another as long as three and a-half months. In the benign tertian case which relapsed, and in which parasites were found, twelve days was the time of apyrexia.

Of the 33 relapses, 14 were malignant tertian; 19 were benign tertian.

The average time under treatment before relapse was: malignant tertian cases, 45·85 days; benign tertian cases, 36·42 days.

Cases with more than one relapse: malignant tertian, 3; benign tertian, 4.

Number of smears examined for parasites from January 1, 1911, to December 31, 1911, was: malignant tertian, 27; benign tertian, 35; negative, 22; not differentiated, nil.

Recognizing the importance of ascertaining the degree of infection of the European troops, it was decided to examine the blood of all men in the station. Five minutes was allowed for each slide, and opposite each man's name in the list was put the result, thus: five minutes $\pm$ (James). Twenty slides were examined in a day—more could not be undertaken, as routine work could not be neglected, and the climate was not conducive to prolonged microscopical investigation.

Months of Greatest Incidence of Mosquitoes.—The months of greatest incidence of mosquitoes were, in my experience, from September to November, though other officers have noted March and April.

The anopheles mosquitoes found were: *Myzomyia culicifacies, M. Rossi, Ch. pulcherrima, Pyrethophorus jeyporiensis.*

Captain J. Anderson, I.M.S., found *Ch. pulcherrima* breeding in the Beyla tank—tank "L" on the map.

Captain F. C. Fraser, I.M.S., wrote to me as follows: "The Beyla tank 'L' and a tank the other side of the city always harboured larvæ of *Ch. pulcherrima*. Jacob's tank to the north of cantonments was sterile (chiefly because it grew no weed like the two former tanks). I always noticed that when the water rose in the Beyla and submerged the weed, the larvæ grew scanty, or disappeared; as soon as the water sank to the level of the weed, the larvæ began to teem. In several bungalows in Cantonments, and once in the Jail gardens, in small pools due to pipe-water waste, or watering, larvæ of *P. jeyporiensis* were found. These were the only two kinds I ever detected, and they were never found together; one kept to the tanks, and the other to the pools, and both are mosquitoes with an evil reputation for carrying malaria, especially *Ch. pulcherrima*. Colonel Adams, R.A.M.C., sent me a mosquito caught in his house which proved to be *P. jeyporiensis*, and I have taken both kinds in the club wash-house."

I lived in Colonel Adams' bungalow, mentioned above, while at Hyderabad, and I hardly ever saw a mosquito in it, though it is

only 200 yards from a small native village, which must swarm with mosquitoes. I know the children living in this village have a high spleen index, though I regret I was never able to make a reliable census. Of all the European troops I examined, I only found enlarged spleens in 5·12 per cent.

The Club is within 100 yards of the Beyla tank "L," which was the chief breeding-place in cantonments, as mentioned before. A small tank marked "NN" on the map gave no trouble, as it was not deep, being merely a depression where rain water, and water from the swimming bath, used to collect. It was graded and filled in the same manner as tank "L." Many complaints were made to me that I was spoiling the only green and picturesque spot in Hyderabad, and also killing all the grass on the cricket ground; all this may be true, but I, for one, prefer an arid waste to malaria. As far as watering the cricket ground goes, water can be found about 20 ft. below the surface, and it should be quite easy to sink a shallow well and pump up sufficient water for irrigation by means of a windmill.

The breeding-places of mosquitoes in officers' compounds gave a certain amount of trouble until I abolished all catch-pits and had the bath waste run into gardens with quick-growing plants, such as canna and guinea grass, in them. Funds did not admit of a mosquito brigade being kept up for the officers' lines as well as for the Sudder Bazaar, so I arranged that the sanitary orderly of each unit should visit the officers' bungalows of his own corps, and report to me if any insanitary condition was found. I found this plan to work well.

And now to compare the admissions for malaria for 1911 with that of the previous year :—

Malaria Cases by Months.

1910.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	20	12	2	10	11	3	6	6	3	14	38	40

Ratio per 1,000 Average Monthly Strength.

Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
32·62	20·16	3·35	17·33	18·90	5·10	10·60	10·86	10·38	60·60	73·78	69·56

Malaria Cases by Months.

1911.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	12	8	6	11	17	11	2	2	4	5	3	3

Ratio per 1,000 Average Monthly Strength.

Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
20·54	13·55	10·61	20·67	30·96	19·89	3·77	3·81	7·39	8·71	5·35	5·23

Malaria Cases by Months.

1912.	Jan.	Feb.
	3	4

Ratio per 1,000 Average Monthly Strength.

Jan.	Feb.
4·35	7·11

Officers. 1910		*Officers.* 1911	
Strength	13	Strength	15
Malaria cases	6	Malaria cases	2*
Ratio per 1,000	461·53	Ratio per 1,000	133·33

* One officer admitted twice.

Women. 1910		*Women.* 1911	
Strength	33	Strength	39
Malaria cases	6	Malaria	*Nil.*
Ratio per 1,000	181·86		

Children. 1910		*Children.* 1911	
Strength	47	Strength	62
Malaria cases	6	Malaria	*Nil.*
Ratio per 1,000	127·65		

Pyrexia of Uncertain Origin.

1910	1911
2	2

Sand-fly Fever.

1910	1911
20	*Nil*

One officer remarked to me that my figures were valueless because of their paucity. My reply to all who are of a like mind is, that I do not aspire to be a compiler of statistics, I merely state facts and figures as they occurred at Hyderabad. I regret that opportunity did not offer of ascertaining to what extent the mosquito population was infected.

Much still remains to be done, namely, to find out the percentage of mosquitoes with zygotes in their stomachs and sporozoites in their salivary glands, also the seasonal variation in infectivity.

One of the Royal Army Medical Corps officers, now stationed at Hyderabad, is being trained at Amritsar in special malaria work, and he will be able to afford valuable assistance in further antimalaria work at this station.

I cannot conclude without thanking the following officers and warrant officers for valuable assistance, without which I would have been unable to carry out the work that was done in Hyderabad in 1911: Captain G. W. Mortimer, 10th Jats, the Cantonment Magistrate; Captain J. A. S. Phillips, I.M.S., the Cantonment Medical Officer; Lieutenant W. B. Rennie, R.A.M.C., in charge

of malaria wards; Lieutenant K. G. S. MacQueen, and Assistant Surgeon J. S. Menezes, I.S.M.D., who compiled the greater part of the statistics for me, and kept the various records.

MALARIA CASE-SHEET.

INSTRUCTIONS.

A malaria case-sheet will be kept for each man who has an attack of malaria during the year.

A separate roll of these men will be kept for each regiment and battery.

All cases should be admitted to hospital.

After discharge from hospital each case should be treated with quinine for at least four months.

Especial care should be taken in the case of men suffering from malignant tertian infection, to ensure that they do not return to barracks while crescents are to be found in the finger blood.

No man should be struck off the roll until four months have elapsed since the last manifestation of the disease, during which time he has been under continuous quinine treatment.

NAME NO. AGE SERVICE IN INDIA

REGIMENT OR BATTERY COMPANY OR SQUADRON.

(1) Particulars of first attack in 191–, *e.g.*, clinical and microscopical features, treatment, &c.

ADMITTED DISCHARGED

(2) Whether fresh infection or recurrence of old infection?

(*a*) If fresh infection, give dates showing where probably acquired,

(*b*) If old infection, give particulars of previous attacks, *e.g.*, dates, variety of parasite found, &c.

TREATMENT.

(Any recurrences that may occur during this course of convalescent treatment will be entered as they occur, in red ink, giving full details.)

Date	Treatment and remarks

ADVANCED DRESSING STATIONS AND DRESSING STATIONS IN THEIR RELATION TO THE PERSONNEL AND IMPEDIMENTA OF A FIELD AMBULANCE, TERRITORIAL FORCE.[1]

By Major W. M. H. SPILLER.
Royal Army Medical Corps.

Rapidity of action being an essential factor in the formation and removal of advanced dressing stations and dressing stations, it is imperative that the officers of field ambulances should possess a preconceived plan for laying out these posts, and also a prearranged and systematic organization of the personnel at their disposal.

It is equally necessary that all ranks be intimately acquainted with the personnel, transport and equipment required, and in the case of the latter, not alone with the uses of the various articles, but also with their position in the transport vehicles and their proper location in the dressing stations.

The easiest and at the same time the most satisfactory method of obtaining a thorough working knowledge of the equipment is first of all to recognize the functions and uses of the various "entities" into which a field ambulance can be divided. As, however, a field ambulance consists of three separate and distinct self-contained sections, each section capable of independent action, for our present purpose (i.e., the study of the relationship borne by the personnel and equipment to advanced dressing stations and dressing stations) it is only necessary to consider the impedimenta of any one section. As the personnel of "A" section is somewhat different to that of either "B" or "C" section, I will deal with "B" section. It is also assumed that suitable buildings for the advanced dressing stations and dressing stations are not available, for if such were the case a large proportion of the equipment would not be required and to unpack it would be a tactical error.

In considering personnel, transport and equipment, I propose in the case of the personnel to divide it, not as shown in War Establishments, but into separate departments, e.g., stewards, cooks, clerks, &c. I shall also remove certain men from the

[1] This paper is based on a series of demonstrations given to the officers and men of the R.A.M.C.(T.F.) on the equipment of a Field Ambulance T.F. Every endeavour was made in the demonstrations to impress on each man the necessity of learning the articles of equipment essential for his own particular duty, also its position on the field and the cart in which it is packed.

transport section to other sections, e.g., batmen will be shown accompanying their own officers.

I shall adopt the same method with the equipment, allocating each article to a certain department. By so doing each man will soon learn the equipment necessary for his own duties, its position in the transport and its proper situation on the field. If added to this knowledge a preconceived plan for laying out advanced dressing stations and dressing stations be adopted, along with a systematic organization of the personnel available, that celerity of action so essential for the erection and demolition of these tactical posts becomes only a matter of practice and can easily be obtained.

Without these plans and in the absence of such knowledge disorder can only result.

What therefore are the "entities" into which any section of a Field Ambulance can be divided? Any section can furnish a bearer sub-division accompanied by an advanced dressing station party; or the bearer sub-division can move off unaccompanied, the remainder of the section forming a dressing station, or part of one (the advanced dressing station in the latter case being formed by another section). We will therefore consider :—

(A) The Bearer Sub-division together with the Advanced Dressing Station Party.

(B) The Dressing Station alone.

(A) Bearer Sub-division with Advanced Dressing Station Party.[1]

PERSONNEL.*

Bearers.			Advanced Dressing Station.	
Officer		1	*Officers*	2
Bearers, N.C.O.	1		*Stewards' Department, viz :—*	
Bugler	1		1 N.C.O. = Steward	
6 S. Squads =	36		1 ,, = Pack store-keeper	
	—	38	1 Private = Washerman	
(x) *Signaller*		1	2 Privates = Supernumeraries (1 Signaller, 1 Carpenter)	
One of Supernumeraries of tent sub-division			Total	5
			Nursing Department, viz. :—	
			1 N.C.O. = Nursing Serjeant	
			1 N.C.O. = Dispenser	
			7 Privates = Orderlies	
			Total	9

* Spare drivers and spare horses are not considered.

(x) Removed from tent sub-division, as he would accompany the bearers.

[1] Advanced Dressing Station Party = a tent sub-division with medical store cart and water-cart (R.A.M.C. Training, p. 109).

BEARERS.			ADVANCED DRESSING STATION.	
			Cook's Department.	
			1 N.C.O. = Corporal cook	
			1 Private = Cook	
			Total	2
			Clerks' Department.	
			1 N.C.O. } Clerks	
			1 Private }	
			Total	2
TRANSPORT.			*Transport Department.*	
Wagon Orderlies	3		1 Transport Serjeant	
Drivers	3		2 Drivers	
(x[1]) Batman	1		2 Batmen	
	—	7	Total	5
VEHICLES.				
(x[2]) Ambulance wagons		3	Medical store cart	1
			Water cart	1
ANIMALS.				
Riding horses	1		Riding horses	3
Draught horses	6		Draught horses	3
	—	7		

(x[1]) Sent with bearers to look after officer's charger.

(x[2]) Explained to men that ambulance wagons are not always with the bearers.

Equipment.

(See F. S. Manual Medical). Packed in forage cart. In the following table equipment is divided into sections as required by the bearers, and the various detachments of the advanced dressing station :—

BEARERS.

(1) Medical and surgical—
- 6 Haversacks
- 1 Medical companion
- 7 Water bottles

(2) Ordnance—
- (*a*) Stretchers, 6
- (*b*) Signalling flags, 2 (For signaller detached with bearers)
- (*c*) Directing flags

ADVANCED DRESSING STATION.

(*a*) *Stewards' Department.*
- (1) Supplies—Medical comfort pannier
- (2) Ordnance—Entrenching pannier, pannier (H), lamps, ground sheets and blankets

(*b*) *Nursing Department.*
- (1) Medical and surgical equipment—
  - 1 pr. field surgical panniers
  - 1 field fracture box
  - 1 reserve dressing box
- (2) Ordnance = 1 filter

(*c*) *Cooks' Department.*
- Ordnance equipment = digging tools, kettles

(*d*) *Clerks' Department.*
- *Ordnance* — distinguishing flag-pole and pegs
- Flags (packed in (H) pannier)

(*e*) *Transport Department.*
- (1) Supplies—compressed forage
- (2) Ordnance — buckets, picketing gear

Note on Packing of Medical Store Cart.

Being a two-wheeled vehicle, the balance of the cart when packed must be borne in mind. It is, however, imperative that the stretchers, surgical haversacks, medical companion and water bottles,

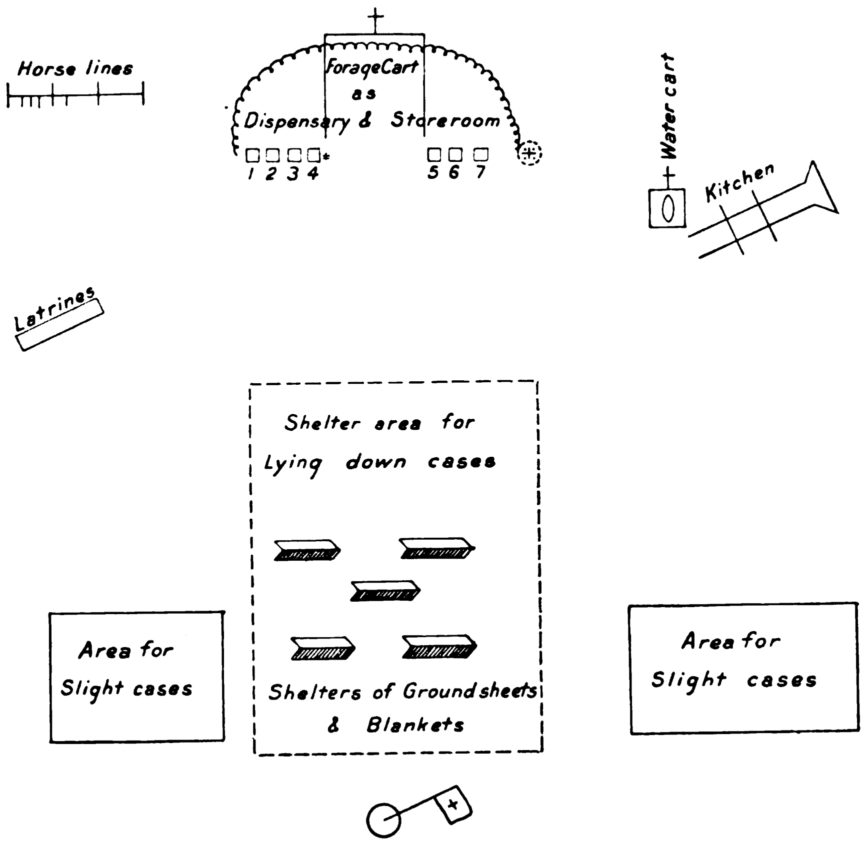


Fig. 1.

* (1) (2) One pair "F" surgical panniers.
(3) "F" fracture box.
(4) Reserve dressing box.
(5) Medical comfort pannier.
(6) Pannier "H."
(7) Entrenching pannier.

and two signalling flags and directing flags be packed in such a way as to be easily got at, as they will be required first. The stretchers can be placed along the projecting sides of the cart and the haversacks,

&c., in rear of cart. The distinguishing flagpole, as also Pannier H, which contains the flags, must be easy of access. The remaining contents can be unloaded in a few minutes, but the medical and surgical boxes must be so placed as to be easily removed.

Plan of advanced dressing station and detail for forming the same, as actually practised during the last annual training at my suggestion. (*Fig.* 1.)

The section having arrived at its destination, the bearer party is disengaged and sent off to its collecting area. Before doing so the officer in charge of the bearers orders the stretchers and other bearer equipment to be removed from the forage cart. He *must* also be accompanied by his signaller and batman. The advanced dressing station is then formed as follows:—

The officers dismount and hand over their chargers to their batmen; areas for seriously wounded and slightly wounded, sites for forage cart, latrines and kitchens (in neighbourhood of which the water cart is placed) are selected. (See fig. 1.)

The transport department unharness, water, feed and picket the horses. Simultaneously the forage cart is unpacked under the supervision of the steward, care being taken to separate the medical and surgical equipment from the ordnance. As the clerks have no work to perform till the arrival of the wounded they are made responsible for the erection of the Geneva Cross flag. The cooks dig the kitchen, fill kettles and prepare medical comforts. The supernumeraries dig the latrines.

The remainder (with the exception of the nursing serjeant and dispenser, who with the assistance of the steward improvise a temporary dispensary out of the empty forage cart) erect temporary shelters with ground sheets and blankets in the area within the advanced dressing station allocated by the officer commanding for the reception of lying-down cases. The various medical and surgical boxes are opened, sterilization begun, and dressings and lotions prepared by the dispenser. On arrival of the sick and wounded one or more men are placed at the entrance of the advanced dressing station to point out the areas allotted for walking cases, and the shelters for more seriously injured. They are seen by the officers, and treatment prescribed if necessary, after which they are fed. The walking cases collected into groups are marched off in charge of the senior wounded man to the divisional collecting station, and the lying-down cases disposed of as circumstances determine.

B. Dressing Station.

(Formed by one tent subdivision with its transport.)

PERSONNEL.*

Officers		2
Steward's Department:	1 N.C.O. = Steward	
	1 ,, = Pack storekeeper	
	1 Private = Washerman	
	3 Supernumeraries { 2 Signallers, 1 Carpenter	
	Total	6
Nursing Department:	1 N.C.O. = Nursing Serjeant	
	1 ,, = Dispenser	
	7 Privates = Nursing Orderlies	
	Total	9
Cooks' Department:	1 N.C.O. } Cooks	
	1 Private }	
	Total	2
Clerks' Department:	1 N.C.O. } Clerks	
	1 Private }	
	Total	2
Transport Department:	1 N.C.O. = Transport Serjeant	
	4 Privates = Drivers	
	2 ,, = Batmen	
	Total	7

Vehicles.

2 G.S. wagons = { 1 Medical store wagon, 1 Baggage and supply wagon }
1 Medical store cart
1 Water cart

Animals.

Riding horses	3	
Draught horses	7	
	—	10

(Water cart has 2 horses in peace, Peace Establishments T.F.)

* Spare drivers and spare horses are not considered.

Equipment.

This is packed in the Medical Store Cart and G.S. Wagons (see F. S. Manual Med.). It is separated as required by the various departments forming the dressing station.

	MEDICAL STORE CART	MEDICAL STORE WAGON	BAGGAGE WAGON
Stewards' Department (6)	*Supplies*	*Supplies*	*Supplies*
	Medical comfort pannier	Medical comfort pannier	Rations
	Ordnance	*Ordnance*	*Ordnance*
	Pannier (H)	Stretchers	Grocery pannier
	Ground sheets and blankets	Operating tent	Clothing chest
		Panniers (E) (F)	Ground sheets
			Cash box

	Medical and Surgical Equipment		
Nursing Department (9)	F. Surgical panniers Field fracture box Reserve dressing box *Ordnance Equipment* Filter	F. Medical panniers Surgical haversack Medical companion Reserve dressing box *Ordnance Equipment* Panniers (C) (D) (G) Operating table ,, mattress ,, lamp Palliasses Dressing box Stools, filter	*Ordnance Equipment* 4 bell tents
Cooks' Department (2)	Digging tools Kettles	Portable stove kettles Panniers (A) (B)	Kettles Butcher's case Spring balance Frying pans
Clerks' Department (2)	Distinguishing pole Directing pole Flags in (H) pannier	Camp table Camp chairs Stationery box	
Transport Department		Compressed forage	Picketing gear Repair pannier Veterinary wallet Horse buckets Officers' baggage Compressed forage

As the medical store wagon and baggage and supply wagons are four-wheeled vehicles, the question of balance does not require consideration. In the case of the former the operating tent must be placed in the wagon last, as it will be the first article required. It is immaterial how the other articles are placed in the wagon, as by the time the operating tent is pitched (half an hour) all the articles will be neatly separated on the ground and available for the various departments of the dressing station. With regard to the baggage and supply wagon, the bell tents must be placed in the rear of the vehicle with the picketing gear close to them. The officer's baggage and the ground sheets for the personnel, along with the clothing chest and repair pannier, are the least essential articles, and should be placed in the fore part of the wagon.

Plan of Dressing Station.—(Showing position of panniers.)[1] (Fig. 2.)

[1] In order to impress the principal contents of each ordnance pannier on the men, they were given distinctive names, viz. :—

"A" pannier	= dining pannier	"F" pannier	= general utility pannier
"B" ,,	= cook's pannier	"G" ,,	= excretal pannier
"C" ,,	= operating tent	"H" ,,	= forage cart pannier
"D" ,,	= ,, ,,	"I" ,,	= entrenching pannier
"E" ,,	= oil pannier		

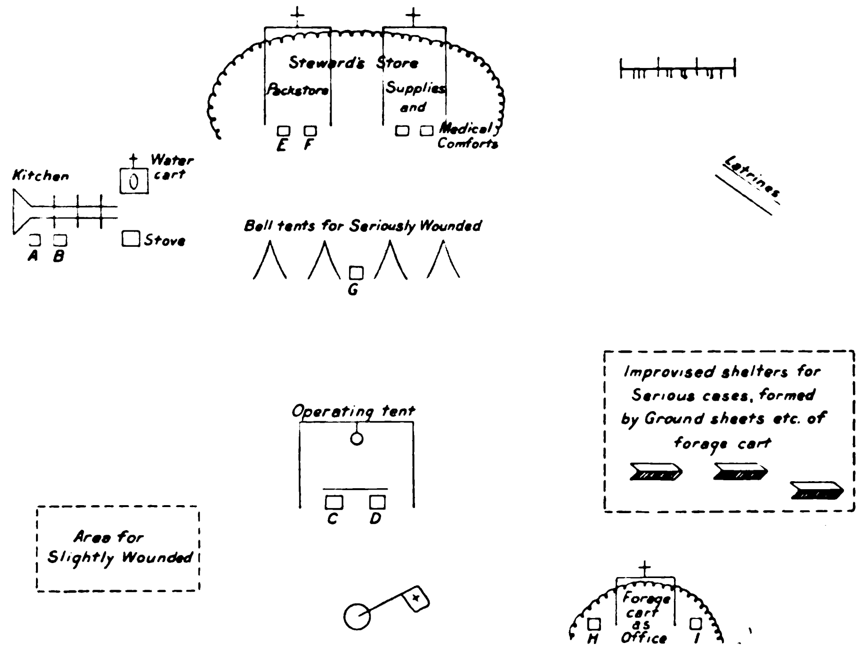


FIG. 2.

Drill for Pitching a Dressing Station.[1]

General Remarks.—The first essentials are the pitching of the operating tent, the four bell tents, and the erection of the distinguishing flag. Excluding transport personnel and officers, the numbers available are nineteen. For the operating tent seven men (1 N.C.O. and six men) are necessary, for the bell tents eight men, and two are required for the flag. All ranks must therefore perform manual labour if a rapid result be desired.

Method.—The officers dismount, hand over their chargers to their batmen, select a position for the G.S. wagons (future storeroom); medical store cart (future reception office); sites for kitchen latrines and mortuary; areas for slightly wounded and seriously wounded; they also point out the position for bell tents and operating tent. Then the officer in charge organizes his personnel as follows:—

As before, the clerks erect the distinguishing flag and then unpack the forage cart—their future office. On the formation of their office they collect the camp table, camp chairs and stationery

[1] Actually carried out at annual training, 1911, by No. I. and No. II. Field Ambulance, West Lancashire, Division T.F., under my supervision.

box, by this time unpacked, and equip the office with these articles, thus being ready to act as a receiving station.

The steward and N.C.O. cook superintend the unpacking of the G.S. wagons. The remaining personnel are divided into (*a*) bell tent party; (*b*) operating tent party.

(*a*) The bell tent party, consisting of the nursing serjeant and seven nursing orderlies (eight in all), remove the bell tents from the baggage and supply wagon and pitch them. This will take about seven minutes.

Two of the orderlies next equip these tents with ground sheets, palliasses, blankets, and the excretal receptacles found in pannier "G." (the excretal pannier) which they place in the vicinity of the tents. The remainder carry the medical and surgical boxes from the medical store cart and wagon, also the operating table, mattress, lamp, and panniers (C) and (D) to the neighbourhood of the operating tent, still in course of erection. Having done this they, under supervision of the nursing serjeant, erect, in the allotted areas for serious cases, temporary shelters made out of the ground sheets and the blankets taken from the medical store cart by the clerks.

(*b*) *The Operating Tent Party:* The dispenser and six men (viz., one cook and five men from the stewards' department) remove the tent from the medical store wagon, and pitch it (twenty-five minutes will be required). On completion of this work the six men return to their respective duties, e.g., the pack storekeeper, the washerman, and the three supernumeraries report to the steward and under his direction improvise a store-room with the tarpaulins of the wagons, to act as a packstore and a stewards' store (see diagram). The panniers (E) and (F), the oil and the general utility panniers, are placed to act as a table for the pack storekeeper who obtains his Army forms from the stationery box. In the stewards' store are the supplies and medical comfort panniers.

The cook (private) reports to the N.C.O. cook who has collected the kettles, portable store, firewood and digging implements and also panniers (A) and (B) and begun the kitchen. A soakage pit is dug, water boiled, and rations prepared.

To Equip the Operating Tent.—The two nursing orderlies, who by this time have equipped the bell tents, with the assistance of the dispenser serjeant now equip the operating tent with the various articles placed in its vicinity by the bell tent party. The operating table is first placed in position to enable a man to reach the ridge pole and hang up the operating lamp; the operating table having no legs is placed on panniers (C) and (D) (see diagram), such articles as hair clippers, tow, hand towels and operating aprons

being first removed.[1] Next the lamp is placed in position by two men. The various surgical and medical boxes are next brought into the tent, opened by the dispenser, dressings and lotions prepared and the sterilizer set alight. The box for the operating lamp is arranged as an anæsthetist's table. The mattress is placed on the operating table, covered with towels, the aprons and towels are prepared. Everything is now ready for the reception of the wounded.

Satisfactory and rapid results can only be achieved by instituting some such systematic scheme as herein described. The method delineated is not claimed to be ideal or incapable of improvement. It is however a practical one ensuring an absence of confusion, a simultaneous performance by each man of his own particular duty, and rapidity of action, as the appended somewhat interesting results, obtained at last year's training, I think fairly prove.

	Minimum times taken to—	
	Erect	Remove
(1) Advanced dressing station	10 mins. ..	5½ mins.
(2) A dressing station	30 ,, ..	14½ ,,

The removal times were taken from the moment the wounded were placed in the ambulance wagons. With regard to the time taken to erect the dressing stations, it is only right to state that the blankets and ground sheets for shelters were prepared ready for setting up beforehand, that the palliasses were not filled with straw, and in the case of the advanced dressing stations, the unit achieving the ten minutes result did not dig a kitchen, as it—the unit—carried a movable iron grate filled with fuel somewhat after the pattern of the incinerator depicted in R.A.M.C. Training, Part II, page 82.

In every instance the sterilizer was set alight, actual sterilization carried out, dressings and lotions prepared, and in the dressing stations the acetylene lamp was placed in position and the gas generated. The horses were picketed, watered and fed.

Some points to remember.

(*a*) Officers must be accompanied by their batmen and see that the chargers have the necessary picketing gear.

(*b*) The O.C. bearers must remove the proper equipment from the medical store cart and must be accompanied by his signaller.

(*c*) The dispenser must be given the keys of the medical and surgical boxes and operating lamp box.

(*d*) The steward should have the keys of the other panniers and should unlock them when taken from the cart.

(*e*) The N.C.O. clerk should have the key of the stationery box in his possession.

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[1] The table will be low but can be raised by placing medical panniers on top of panniers (C) and (D).

THE SANITARY ASPECT OF A BESIEGED TOWN.[1]

By Colonel GUY CARLETON JONES, M.D., C.M., M.R.C.S.

Director-General of the Medical Services of the Militia of Canada.

There is no condition or circumstances where the medical situation, both civil and military, has such an important bearing upon the general military issue at stake as when a town, city or fortress is besieged.

All wars do not produce sieges, but the experience of recent wars shows that sieges may be expected, and will have a most important strategical value. When a town or city is surrounded and cut off from the outside world, and forced to depend on its own resources, the sanitary situation becomes one of immense importance.

The locality may have been sanitary. All that modern device or knowledge can do may have been done to bring about sanitary perfection. Everything changes under these altered conditions, till eventually the safeguards of sanitation cease to exist or become ineffective, and as a result we have sickness and death, not only amongst the military, but also amongst the civil population, including the old, the women, and the little children. We might find it profitable, as officers of the Sanitary Service of the Militia, to study the subject of sieges from the standpoint of public health.

Siege warfare is primitive warfare, differing only in the character of weapons and engines of destruction used in various ages. There is only one weapon that never changes, the weapon of insanitation. The besieger endeavours now, as he has always endeavoured, to render the besieged town so insanitary that existence will no longer be possible for the civil and military population of that town.

This state of affairs may be brought about by cutting off the water supply, or by making it impossible for the besieged to get rid of excreta and refuse of all kinds. As a result of the siege, a general state of misery, discomfort and poverty may be produced, predisposing to epidemics of all kinds.

During the past fifty years the civilized world has seen many sieges. Read the personal accounts of these and you will see no

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[1] Read before the Section of Military Hygiene at the Second Annual Meeting of the Canadian Public Health Association, Toronto, September, 1912.

difference between them and the sieges of the Middle Ages. The same sickness and dire distress, the same object of the besieger to make the particular area of land represented by this beleaguered town unfit for human habitation. All classes and all people suffered, the guns were not levelled on the troops alone, but on the citizens, their property and belongings. In every case the insanitary conditions, brought about by the efforts of the enemy, was the cause of capitulation, or of a feeling that unless relief came surrender must be the inevitable result. Modern armies do not poison wells, but they do cut off water supplies. The water supply of Port Arthur was cut off when the Japanese took the village of Shui-shih-Ying in September, more than four months before the capitulation. This severing of the main artery of the city must have been an important factor in determining the issue of the siege. It does not take much imagination to picture the condition of affairs in a watered and sewered town when the water supply is cut off. Wells may be abundant, as they were in Port Arthur, because the introduction of piped water was recent; but these wells have been in disuse and are often contaminated, and though, if pure, may supply drinking water, can never supply cleansing or flushing water. Some of you may remember what happened in Quebec at the time of the Tercentenary, when the water was cut off for less than three days. In one battery alone the use of well water as a substitute produced fourteen cases of enteric.

The pressure of modern sanitary conditions in a fortress city is an element of danger. In Quebec, one of our fortresses, the condition is exactly the same as Port Arthur. There is no doubt but that an enemy besieging Quebec would endeavour to cut off the water supply from Lake St. Charles. The very fact that the water pipes and sewer pipes have now been in Quebec for many years would make the sanitation even worse than it was at the time of its famous siege three hundred years ago. The water supply cut off and the sewers useless produce a condition which is aggravated by the general insanitary surroundings. The people, probably increased in numbers, are crowded in certain areas of the town, their movements are restricted, a congestion is produced when buildings, dwellings, and perhaps whole areas become untenable. The last great siege on this continent was just fifty years ago, when Vicksburg was surrounded and finally captured by General Grant. The citizens of that town were obliged to resort to the safety of caves cut out in the high clay banks; here they found safety from

the bombardment and lived in security if not in comfort for many months, and were safe from the shells of the Navy which were dropped into the city, night and day, without intermission. Can we picture the sanitary condition?

Starvation and improper food are used by the enemy as his most potent weapons. The heroic deeds of the inhabitants of besieged towns, enduring the awful sufferings of hunger, seeing their children and their sick suffering in the same way, these deeds form the most inspiring theme of history, modern or ancient: it is all the same, the besiegers aiming at one object, the besieged suffering the one misery. The price of food rises high beyond the purse of the majority. Even in Port Arthur, where there was a sufficiency of certain foods, the price of an ox was 350 dollars, a pig 150 dollars, a fowl 7 dollars, an egg 50 cents. Fresh vegetables and fruit were soon exhausted; the result was disease. The disease chiefly apparent was scurvy; the prevalence of this disease was the main ostensible cause of the capitulation. Lynch says that no opportunity for the study of scurvy for years to come will approach that given at Port Arthur. It is more than a point of interest to consider what might have been the bearing on the final outcome of the war, if the sanitarians had taken the precaution to have seen that a needful supply of a prophylactic, such as lime juice, was provided for the garrison of Port Arthur. Other causes help, and the result is a city stormed and captured by infection and death. This is a condition of war, a new condition, and all efforts of the sanitary service must be directed towards its prevention and remedy; and, as most sieges end because the sanitary state renders life impossible, and not because of bombardment, we might almost say that the sanitarian is the first line of defence, and that the soldiers in the forts and trenches are only holding the human enemy so that he, the sanitarian, may conquer the strongest and most virile enemy—disease—and so conquering make the fortress impregnable.

Clinical and other Notes.

A CANAL BARGE ADAPTED FOR THE TRANSPORT OF WOUNDED.

By W. ERNEST NELSON.

Commandant, Warwick, No. 11, Detachment.

THE following is a short account of how an ordinary canal barge was fitted out for the transport of the wounded, at a Red Cross Inspection held at Warwick on June 29, 1912, by the Henley-in-Arden Men's Detachment (Warwick, No. 11) of the British Red Cross Society's Voluntary Aid Detachments.

The barge provided on this occasion was an ordinary canal coal barge. These barges measure some 60 ft. to 70 ft. in total length. Some have a covered cabin at each end, others at one end only. The available space for practical purposes is, however, about 50 ft. × 6 ft. inside measurement.

It should be noted that these barges vary somewhat in their measurements; I measured three barges before the date of this demonstration, and found that all differed somewhat, and the barge which was finally provided on June 29 differed again from these others.

The barge in question proved to have a working space 50 ft. × 6 ft. 3 in., inside measurement, a good-sized covered cabin in the stern, and a kind of small covered compartment in the bows, the latter being little more than a large box for carrying spare rope, &c.

The first thing to be done was to clear the available working space of all cross boards and other fittings. On this being done, a clear working space was left measuring 50 ft. × 6 ft. 3 in. × 4 ft. deep.

A measuring tape was then run along the side of the barge and the centre point was marked on the gunwale in red chalk. As the plans had to be prepared beforehand it was thought advisable to work from the centre in all cases, as the exact length of the barge was not known; this ensured an equal space being left at each end after the berths for the stretchers had been fixed. Still working from the centre the gunwale was then marked off in feet in white chalk and every five-foot mark was numbered, viz: 5, 10, 15, 20, &c. Lastly, the positions of the cross-poles, which formed the berths for the stretchers, were marked in green chalk—these were practically all the measurements that were required.

The measurements in this description are taken for "Furley" stretchers, though on the actual day we used stretchers of all kinds, and the measurements had to be modified accordingly.

If the regulation Army stretcher were used, the poles forming the

Emscote Wharf, Warwick, June 29, 1912.

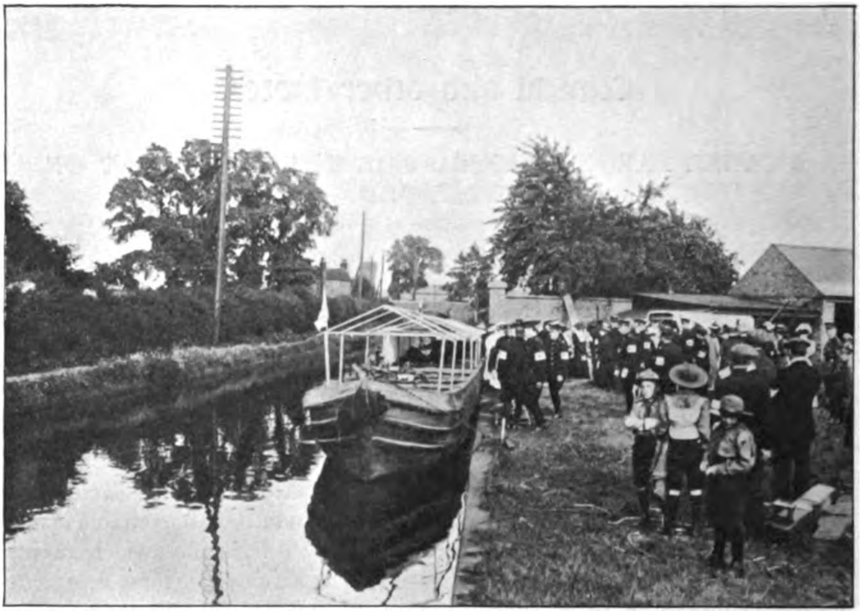


Fig. I.—The barge being fitted up at the wharf side.

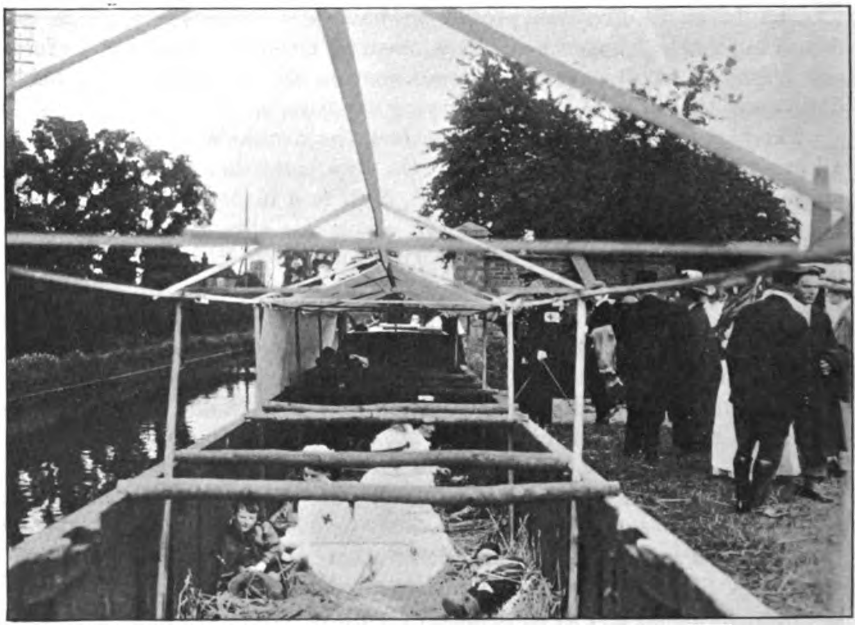


Fig. II.—The barge, end view. The top tier of berths not yet fitted.

[Photographs kindly supplied by the Daily Graphic.

EMSCOTE WHARF, WARWICK, JUNE 29, 1912.

FIG. III.—Inspection of barge, before the top berths were fitted up.

FIG. IV. –Conveying the "wounded" from the barge to the wagons.

[*Photographs kindly supplied by the Daily Graphic.*

berths could be placed in such a position that the stretchers could be fixed in position by the "runners" coming into contact with the poles; this, however, is not advisable with the "Furley" stretcher as the runner is much farther from the handle of the stretcher than in the Army stretcher, which would cause the pole to come into contact with the patient's back, if the canvas of the stretcher were at all loose.

The measurements having been made and the points fixed, the next step was to fix the upper berths. These consisted of stout ash poles some 3 in. in diameter and 6 ft. 9 in. long. For the "Furley" stretcher they were fixed 7 ft. 1 in. apart (measuring from the centre point to allow for any difference in the thickness of the poles). A space of 3 ft. 3 in. was left between each berth.

Four berths were fixed in this manner, forming the upper tier.

The poles were cut out one-third of their thickness at each end and rested on the gunwales, where they were fixed by iron pins.

The upper tier having been fixed in position, the lower tier was then fixed immediately under the upper one. As each berth in the lower tier was only intended to hold two stretchers, lighter poles were used, viz.—1½ in. in diameter only.

Pieces of wood some 6 in. × 5 in. × 1½ in. were fixed on either side of the barge, resting on the floor, a notch was cut in the top about 1 in. deep by 1½ in. to receive the pole and hold it in position.

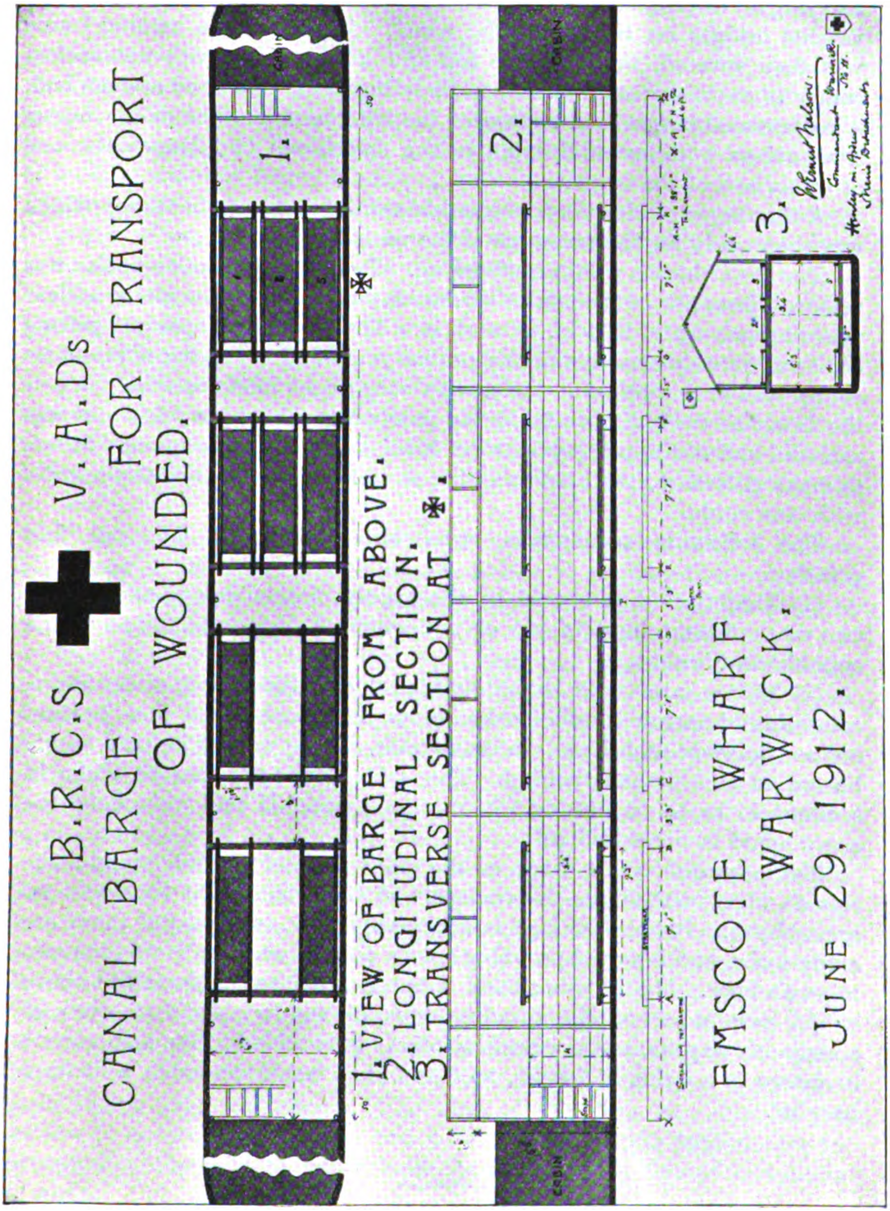
The distance between the poles was 7ft. 1 in. (measured from the centre point as before).

Thus, when all were fixed, there were two tiers of berths, an upper and a lower, each tier having four berths. The upper four berths were capable of holding three stretchers each and the lower four berths two stretchers each—twenty stretchers in all. (See diagram, figs. 1, 2 and 3.) Probably the ideal number would be sixteen stretchers—eight above and eight below, as with this number there would be room for a gangway right down the centre of the barge for upper and lower berths alike. But if necessary twelve stretchers could be put on the upper berths and the attendants could administer to the wants of the patients from the spaces at either end of the stretchers, though this would not be quite so convenient as standing at the sides.

The transverse section shows an upper and a lower berth with five stretchers in position, three on the upper berth and two on the lower one, with a gangway between the stretchers in the lower berth.

When all the berths, upper and lower, had been fixed it was found that there was a space of 6 ft. left at either end of the barge. Steps were fixed at the side to each of these spaces and also seats for the attendants. The spaces would also be available for water butts, cases of dressings, provisions, &c.

The framework for the awning was next erected; this was carried on fourteen upright poles 6 ft. 6 in. in height, the total height to the highest


B.R.C.S V.A.Ds
CANAL BARGE FOR TRANSPORT
OF WOUNDED.
1. VIEW OF BARGE FROM ABOVE.
2. LONGITUDINAL SECTION.
3. TRANSVERSE SECTION AT ✠.
EMSCOTE WHARF
WARWICK.
JUNE 29, 1912.
CABIN
CABIN

point being 8 ft. from the bottom of the barge, it being estimated that carrying an awning of this height an empty barge could pass under the various bridges on this particular canal. A part of the awning frame was then covered, both on the top and at the sides, with unbleached calico to represent canvas, and a Red Cross flag was fixed at each end. A professional bargee had charge of the tiller and another of the horse. Two nurses were accommodated in the cabin, and two attendants, one at either end of the barge.

A thin layer of clean straw was laid on the floor of the barge which was then ready for the reception of the wounded.

The lower berths were first filled up. To do this one of the poles was removed from one of the centre berths of the top tier, thus giving a clear space measuring 10 ft. 4 in. to work in. The method adopted of getting the stretchers on board was the ordinary method of taking a stretcher over a wall or any other obstacle, with very slight modifications. When the lower berths had been filled, the pole which had been taken out was replaced and the upper berths were filled up in the same manner; then, to make all secure, the handles of the stretchers were lashed to the poles with thin cords.

The following suggestions were also made, but not put into practice:—

(1) That the barge should be thoroughly cleaned inside and receive two coats of some light brown or buff-coloured distemper, mixed with a suitable disinfectant.

(2) That a false floor should be placed over the bottom of the barge, consisting of narrow boards fixed on cross pieces and placed so as to leave a space between each board, so that water, due to rain or leakage, would lie under this second flooring. This false flooring should be made in sections to be taken out for cleaning purposes. If this were done the straw could be dispensed with.

The easy motion of a barge, on the still waters of a canal, would make this an ideal method for the transport of the wounded if time were no great object. But the passage is necessarily slow, especially if there are many locks, and it would probably not be easy to average more than two miles an hour. On the other hand, a barge fitted out as described above would have none of the disadvantages of country carts or even of ambulance wagons, and if a medical officer were added to the staff, or one in charge of a string of barges, so fitted, they would resemble a floating hospital.

A METHOD OF TEACHING CAMP SANITATION.

By Captain M. CRAWFORD.
Royal Army Medical Corps.

The following brief description of a method of teaching Camp Sanitation by models may be of interest to readers of the Journal, especially to those engaged in Territorial work. It is, I believe, new in the sense of its application to Army Schools of Instruction.

The method consists in demonstrating field sanitary arrangements by means of models and a tray of moulding sand, in which the necessary pits and trenches can be made in the presence of the class.

The variety of sand used is important; ochre-coloured moulding sand has been found satisfactory. It is sufficiently plastic when damped and pressed down for the edges of a trench cut therein to remain in position. Ordinary sharp river sand will not do. A sand surface about 2½ ft. square is required, with a depth of about 4 in. A shallow wooden tray to hold the sand can be used, or a special tray-topped table. If the latter, it must be strongly made, as the sand is heavy. Both plans are in use.

The implements required are few: a moulder's trowel with a narrow blade, and a tin scoop with a square section to cut trenches. A child's garden watering pot with a fine rose to damp the sand. A flat piece of wood with rounded edges and a handle for smoothing the surface.

The models used with the sand are not expensive; a few are mentioned here: Camp-kettles and pails (made by a tinsmith—small mustard tins will do); coloured wooden blocks to represent sods; a canvas screen fastened to wooden skewers; tin cigarette boxes with perforated bottoms for grease traps; picketing gear for horse lines; pebbles to line the American pattern destructor and urinal trenches; miniature blankets for bivouacs, &c., &c.

Two subjects will be taken to illustrate the method—a trench-kitchen and a shallow trench latrine. For the former cut a trench 2½ ft. long[1] and 2¼ in. wide, sloping down to 4½ in. in depth at its deep end, which is splayed out. The model kettles are placed in position over short pieces of stout wire, representing iron bars; a chimney of blocks is built up. Thus a perfect model of a trench kitchen is obtained. The varying depth of the trench and the banking of the clay is demonstrated to the class. If a bit of cotton wool be placed between each two kettles it prevents sand falling into the trench. The plan of changing the order of the kettles to ensure even cooking can be explained, or the kettles may be arranged on the sand to demonstrate the more rapidly formed trenchless kitchen.

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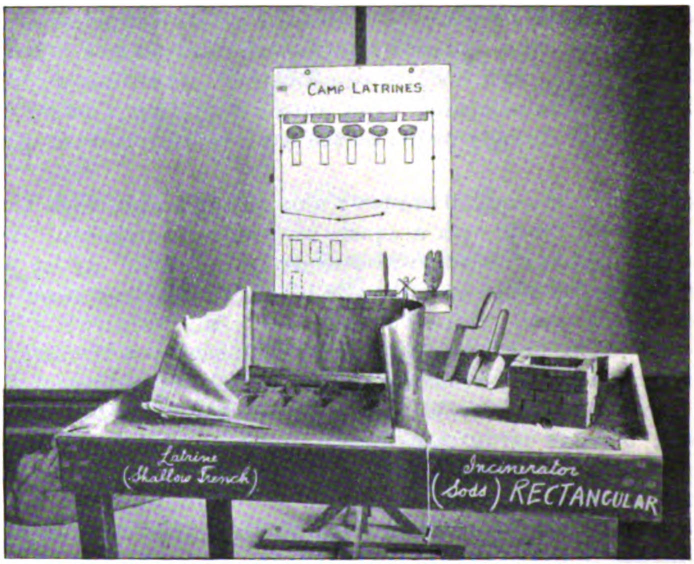
[1] Equals ¼ scale.

To show the shallow latrine system, the sand is smoothed down, the position of the trenches being indicated by a cord, which is marked by tags of coloured rag and stretched between two pegs. The sand dug out is heaped up at the head of the trenches, and blocks to represent the sods placed in position. The whole is then surrounded by the screen. If a deep trench latrine be excavated at the other end of the tray, the differences between the two systems can be explained.

The method is especially fitted for territorial teaching, as most of the instruction has to be given at night. It is impossible during the winter months to go out for field work, even if suitable ground is available, and when summer comes there are many civilian attractions for the men



which reduce the opportunities for instruction before camp. Nothing can, of course, take the place of actual field practice, but men taught on this system have a very clear idea of the subject, and consequently take less time in becoming proficient when training in the field.

Quite apart from these considerations, there is no question as to the lucidity and value of this method of instruction. Seeing the object in all three dimensions impresses the mind in a way no diagram can ever do. It must be remembered that most of the men are unaccustomed to drawings and have done a day's work in civilian life before coming to lecture. Anything, therefore, which can make lectures clearer and more interesting is much to be desired. The expense is not great and

improvisation easy. For the rapid instruction of recruits on mobilization the advantage is obvious.

Some doubt was felt at first lest time would be wasted during a lecture by the necessary manipulations. This was not found to occur, and many time-saving devices are possible. For example—by pressing an inverted jampot into the sand, a cleanly cut soakage pit can be dug without delay; the sand remaining in the pot when it is lifted up. In the same way a tin mould, 3 in. by 1 in. (according to the scale used) is useful for the rapid formation of a row of shallow trenches.

A model terrain is useful for explaining to Officers and N.C.O.'s the best positions for dressing stations or the essentials of field sketching. By its means the demonstration of contour lines is wonderfully simplified, and it serves as an alternative to the usual potato method. For this purpose a large office table is necessary, which can be fitted up as follows: A frame the size of the table top is made of laths about 1½ in. in depth and jointed at the corners by metal hinges from which the pins have been removed and nails substituted. Small blocks of wood nailed to the sides of the frame keep it from sliding off the table. A sheet is laid over all and sand spread on this and heaped up into hills and hollows, slips of evergreen are stuck in to represent trees. Very effective houses, churches and other buildings can be made of thin cardboard after the manner of theatrical scenery, touched up with coloured pencils. They are placed upright in the sand. A little chalk powder dusted on to the roads makes them stand out clearly. On the sand and sheet being removed, the frame is readily taken apart by withdrawing the nails from the hinges at its corners. Bomb-proofs, rifle pits and fortifications can also be demonstrated by this method.

I am indebted to Lieutenants W. Rice and E. Edwards of the 1st and 2nd Fd. Ambs. R.A.M.C. (T.) E.A. Div., for much valuable help, and also to the permanent staff, School of Instruction, R.A.M.C. (T.) E.A. Div., (Serjeant-Majors Walsh and Oxlade, and Serjeant Brice).

A DESIGN FOR A WATER BOTTLE.

By Staff-Serjeant E. B. DEWBERRY,
Royal Army Medical Corps,
AND
GEORGE J. CLARKE, Q.S.A.

Construction.

Part I consists of a vessel formed of two pieces of metal, the body and the base. The body is vertical on its transverse axis and diminishes on its conjugate axis, thus offering a grip to the felt pouch. The body is sufficient in size to admit freely an adult hand for cleansing purposes. The top of the body is flanged and sunk to receive the washer. The body is in one piece of metal and closed with a water-tight joint at A. (Fig. 1.)

The base is stamped in one piece of metal to fit the body and closed with a water-tight joint at B. The shape of the base is such that no part is inaccessible for cleansing.

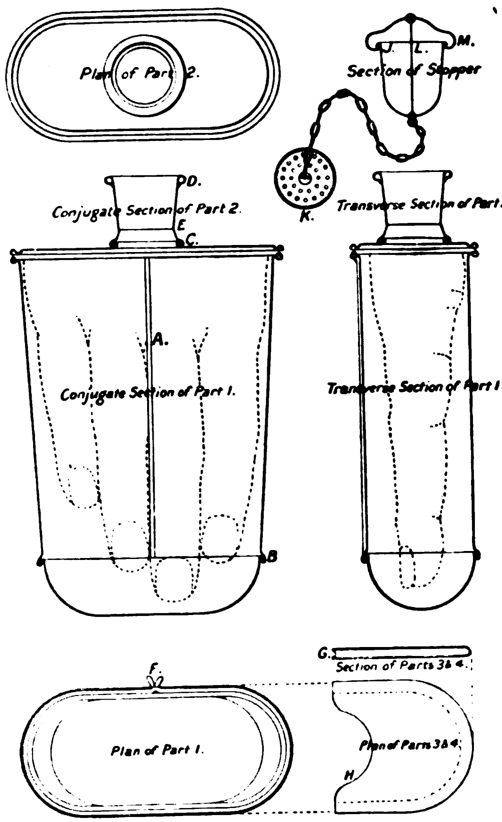


FIG. 1.

Figure 1 shows a vessel and stopper made throughout of aluminium, consisting simply of a body, movable lid, two clips, and a stopper, all easily detachable, every part capable of being easily cleaned. The bottle is light and its contents can be warmed over the fire should coffee or cocoa be substituted for water.

Being made solely of aluminium the design has to be such that the metal can be stamped to shape without fracture, and as aluminium is a great resister of flux all joints are welted and closed by hydraulic power, but are nevertheless thoroughly water-tight.

Part II consists of a movable lid with neck attached.

The lid is flat in order that Parts III and IV may, when in position,

be at fair tension. The edge of the lid is sunk to fit over the washer. The neck is circular in plan and closed to the lid with a water-tight joint at C. The top of the neck D is beaded to obviate a sharp edge coming in contact with the lips and converges to point E to fit the stopper exactly. The neck is easily accessible for cleansing with the index finger.

Parts III and IV are two clips, each being alike, and each stamped to form a groove at the edge. The clips slide on from the shoulder of the vessel, fully covering the sunk flanges to both body and lid, and com-

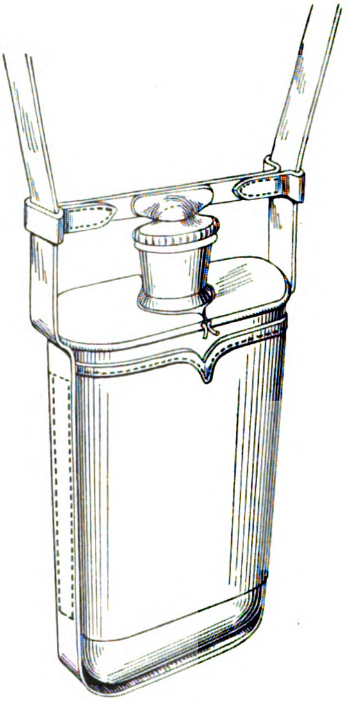


FIG. 2.

pressing them tightly over the washer. The clips are cut away at H to fit up to the neck attached to the lid and are notched at G to allow the short ends of the washer to protrude as shown at F.

The stopper consists of two pieces of metal each stamped to shape and closed with a milled water-tight joint at J. (This joint is milled to prevent the cap from working loose.) The cap is of good diameter and milled on edge M to afford a firm grip to the finger and thumb. The stopper is ground to fit into the neck perfectly and has a fine screw thread.

Attached to the stopper by means of a riveted pin L is an aluminium chain, one link of which is a split ring for disconnecting. At the end of the chain is a perforated disc K. This disc serves a dual purpose: (1) Its normal position inside the vessel prevents the loss of the stopper; and (2) when the stopper is withdrawn to the full length of the chain the disc lodges in the converging neck between C and E, thus preventing insects or solids from entering the vessel, or in cases of tea leaves or coffee grounds, preventing solids within the vessel from entering the person's mouth.

The chain, not being exposed, is not liable to be broken by entanglement with bushes or accoutrements. When packed away in store the lid and stopper can be inverted, thus protecting both lid and stopper and reducing the vessel to a minimum size.

The carrier (see fig. 2) consists of a pouch and shoulder strap. The pouch is a leather bound, felt, bottomless pocket made to fit the body of vessel. The pouch being bottomless the vessel wedges into it and is easily dislodged; moreover, the pouch cannot be used for other purposes and can be easily cleaned. The shoulder strap (similar to that now in use) passes around the pouch and is stitched to it, thereby relieving the strain on the felt caused by the weight of the vessel when filled.

The diverging lines of the strap (when carried over the shoulder) are checked by a cross tension strap which slides up or down as required; the tendency to diverge will cause the cross tension strap to press upon the stopper and also prevent the vessel from being jerked out of the pouch. The tension strap also brings the shoulder strap close up to the edge of the clips, thus securing them firmly.

The Washer is simply a short length of plain soft white twine boiled in white wax, this can be easily renewed at a minimum cost. The twine can be slightly warmed in water and pressed into the sunk groove formed in the flange of body; over this is placed the lid, the inverted groove on the edge of which fits over the washer, and the two clips secure the whole and form a water-tight joint.

In case of emergency plain twine or even a piece of bootlace will temporarily suffice until waxed twine is procurable.

The ends of the washer should protrude at F for inspection and also to afford facility for easy removal or renewal.

Weight empty	about	5	oz.
,, full	,,	25	,,
,, of strap and pouch ..	,,	3	,,
Total ..	,,	28	,,
Capacity	,,	1	pint.

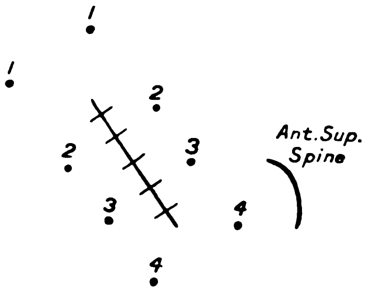
REPORT ON THE METHOD OF FIXING DRESSINGS BY DEEP SUTURES.

By Major F. J. W. PORTER, D.S.O.
Royal Army Medical Corps.

The idea was obtained from the *British Medical Journal* about six months ago. Since then, this method has been used by me in every case of abdominal operation, and in certain other positions (such as the gluteal region) which lend themselves to it.

For the benefit of those who may not happen to have read the communication referred to, I have written the following account. During the last three months fifty-five abdominal operations have been performed in the station hospital, Secunderabad, chiefly removal of appendix and radical cures of inguinal hernia.

Taking the commoner operation (appendicectomy) as an example, the following method is adopted: Before sewing up the external oblique



aponeurosis, four deep silkworm gut sutures are inserted about ½ in. from the edge of the skin incision. Numbers 1 and 4 pass through the tissues superficial to the external oblique. Numbers 2 and 3 pass through the skin and external oblique on one side, about ¾ in. from their cut edges, and taking up a little of the internal oblique muscle, pass through the external oblique and skin at corresponding points on the other side. The four sutures are most conveniently passed by means of a 4-in. straight Hagedorn needle. The ends of these sutures are collected and held by a Spencer Wells' forceps on either side.

The edges of the cut external oblique are then united by a continuous thread, and the skin by interrupted silkworm gut or Michel's clips. The area having been again painted with tr. iodi., a pad of about twenty thicknesses of gauze 1½ in. wide, and extending well beyond the last suture, is held in position and the four sutures tied firmly over it.

No other dressing or bandage is applied.

At the end of forty-eight hours the exposed ends of the deep sutures near the skin are painted with tr. iodi. and cut. The pad is peeled off

in a line with the long axis of the wound, and the deep sutures withdrawn. They usually come out with the pad.

The exposed area is wiped with methylated spirit, and left without any protection. The sutures are removed on the seventh day, and the patient allowed up. No stitch abscesses have resulted, nor any infection of the wound.

The advantages of this method appear to be: (1) Great economy of dressings and bandages; (2) increased comfort to patients in hot climates owing to the absence of masses of cotton wool and bandages; (3) absolute protection of the wound until it can safely be left exposed; (4) total occlusion of dead spaces in the operation area, and consequent limitation of exudation with diminished risk of suppuration.

It should be realized that it is quite impossible to effect occlusion of a dead space in an abdominal wound by pressure applied to the surface. Nothing short of pressure applied *from below* with counter pressure against a pad can effect this. Where there is a good deal of subcutaneous fat, something *can* be done by means of another continuous suture, but this adds the risk of burying additional ligature material. I have used this method in two central incisions with great success.

I think in a hot climate it is unwise to allow the original gauze dressing to remain longer than forty-eight hours. In one case (removal of semilunar cartilage) I left the dressing undisturbed for eight days, and on removing it found the blood and serum, which had exuded immediately after the operation into the gauze, had formed such an impermeable covering that it had exercised all the bad effects which result from covering a dressing with waterproof material. The perspiration had become confined, and had caused the suture line to become sodden and inflamed.

The wisdom of leaving the wound exposed after forty-eight hours has been criticized, but the results in this hospital appear to justify this line of action.

Travel.

AN IDEAL STATION—BERMUDA.

By Mrs. PERCY HOPE FALKNER.

As some officers of the Corps are ordered to Bermuda every trooping season and as the requirements there differ in detail from any other station (except Jamaica), it is well to obtain up-to-date information before proceeding there.

The following facts are written after a sojourn of three and a quarter years in the islands :—

Society.—There is a battalion of infantry, a company of gunners and about seven officers and one company of the Corps usually in the islands, though in former years there was more than double that number. In Ireland Island there is a fine naval dockyard, in which there is usually at least one British ship, and frequently one or two foreign ones. There are a few retired Service people, any number of American residents and American visitors, and the cheap fare season brings American trippers literally by the thousand. Heiresses abound, and are frequently acquired by Service men. The Governor resides in a fine house outside the town of Hamilton, where he holds frequent receptions, dances, &c. In addition, special "shows" are often arranged for foreign ships coming in and sometimes for our own ships. From New Year to the end of May there are always several dances a week, two of the largest hotels giving all the garrison a standing invitation during the season. Excellent golf can be had either on the garrison or the civilian links ; fishing and sailing are also to be had, and boating, bathing, moonlight picnics, tennis, cricket, hockey, can all be indulged in as much as desired. There is practically no riding for ladies, and no polo, horses only being kept for use, and not for pleasure. There is a rather sketchy racecourse where much the same "owners" win every year, but as this is well known there is not much heartburning, and little or no competition. The boat-racing is not the most sporting under existing conditions, as there are no "one class" races, and handicapping therefore becomes rather difficult. For example, a tiny skiff might have to compete with a big yacht, under which conditions it is almost impossible to arrange "odds" that satisfy everyone concerned. This is rather a pity, as it deters many men from racing, but unless one can afford quite a large craft it is not much use competing against those who can.

It is advisable to bring out all sporting equipment, as it is rather expensive to buy them locally. Tennis racquets keep best in a rubber case, and those strung with black gut last much the longest. Even when every possible precaution is taken the racquets suddenly "go" apparently from no visible cause, and here the man scores who can put a new string in, as the charge for this is exorbitant, something like 1s. 8d. a string. It is essential though to keep this accomplishment quite secret, otherwise one would be called upon to do all the racquets in the station.

Saddlery too "goes" very quickly, and though it can often be bought secondhand from departing officers, it frequently turns out unsatisfactory, and in fact it is quite a matter of chance how any harness will turn out. Boats of various kinds can be picked up locally, but it is absolutely essential to see them first, and then to consult someone who really knows about them, as many of the craft have been sold again and again, and are merely repainted and recorked for each change of regiment.

The same sometimes applies to furniture: Do not buy in a hurry or you may hear the auctioneer say, "Bid up, ladies, I haven't had such poor offers for that sofa for the last ten years."

There are two local furniture stores and though the prices have

come down and the goods improved in the last few years, things still seem very dear to the newcomer. Most people have an auction on leaving and it is by far the most satisfactory method, for the vendor anyhow, as no matter what concessions the vendor may make in selling privately, the purchaser usually thinks he could have done much better by buying at an auction, and if after his deal someone else happens to get anything cheaper, he imagines he has been cheated. The best way to furnish therefore is to pick up things as one can at auctions and fill up with necessaries from the local shops. It is well to bring all lace curtains, cushions, linen, blankets, and all sorts of small table necessaries, such as ham frills, paper mats for fish, &c.; reels of cotton are double the home price, and so are all sorts of small needlework accessories; needles and all steel articles must be kept in air-tight bottles or cases.

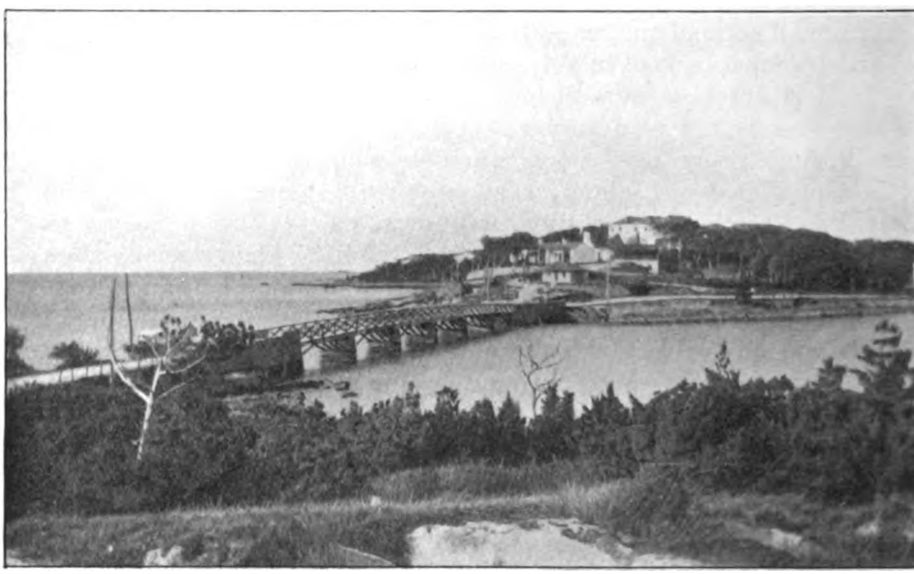
It is not necessary to bring out china and glass specially, but any that is not of a very valuable kind might be brought, and will find ready purchasers when leaving the islands. Large looking-glasses are almost impossible to get and if a lady who is going away has one there is quite a competition to secure it. Quite the best kind to take is the ordinary plain looking-glass framed in white wood, obtainable for a couple of pounds anywhere at home, and made with an "easel" support at the back; this can be packed flat and put into a narrow crate.

Hair mattresses are among the specially expensive articles of furniture in Bermuda, so are pillows, and the officer who is lucky enough to get a house with a fireplace will find it impossible to buy any kind of fireiron or fender; matting carpets are greatly used and small ones cost from 15s. locally, if other kinds are desired it is well to bring them out. Visiting cards, notepaper headings, cresting, and private invitation cards cannot be done on the islands from plates, so it is well to bring a good stock of all these; dance programmes are very dear, and there is a very poor selection. No valuable books or pictures should be brought, as these are ruined in the damp weather. Lamps are largely used and plain ones can be got locally. Coal is supplied free to officers, but if the allowance is exceeded costs £2 7s. a ton. Oil is obtained cheaply through the barrack department. There are only a few pianos for hire and they are most expensive to buy locally, but it would pay officers to bring out a fairly good one, suitable for the Tropics (iron frame, &c.); they would be pretty certain to get a good price for it when leaving. Pianos cost 10s. a time to tune; the best local man is coloured.

Houses are of the bungalow type and are usually available for

all officers of the Corps, from the rank of captain upwards; they are nearly all quite comfortable and are supplied in lieu of lodging allowance. Many of them have fireplaces, and these are a real necessity in the damp, cold months.

Bermuda is a three years' station for the Royal Army Medical Corps, and if ladies get away the second summer they can usually do the whole tour all right, provided they are not delicate. Children as a rule do well and can safely be kept there longer than they could stay in India. The pay is the same as at home, with an additional allowance of 2s. 6d. a day, while allowances can be



drawn instead of rations, at the rate of 10d. a day. At one time "wives" too were allowed rations, but some horrid bachelor came along and asked could he have an allowance instead of the "ration" that he could claim if he had a wife. Instead of handing him over for suitable treatment to militant suffragettes, all the "wives" in the station suffered by having their grant permanently withdrawn.

There are two very large and expensive hotels, and numerous boarding houses; the only hotel making special terms for officers is the Kenwood, where they charge about 8s. a day per head for a family—baths and afternoon tea extra.

Bermuda being only forty-eight hours from New York, most people try to go there during their tour; from there less than a day's travelling takes one into Canada, where one can spend leave quite reasonably. The islands are four days from Jamaica. The latter is very similar in many ways to Bermuda, though not so expensive to live in.

Climate.—The weather seems to vary every year; about Christmas time it is usually fairly cold, and most of the heaviest rain comes in the spring; it may rain for days at a time, but owing to the coral soil dries up very quickly. Last summer was fairly wet, and therefore not so hot as usual, but the rain was so scarce in the previous year that everyone was put on an allowance of water, and, indeed, for a short time there was a certain amount of anxiety felt on the subject. Drinking water is simply rain caught on the roofs of big whitewashed tanks and drawn from them as required. A long spell of dry weather therefore is a serious matter, but usually the rain comes "just in time" to prevent serious consequences.

The hottest months are July to October, while spring is usually the wettest period.

Cost of Living.—Many "foodstuffs" are quite expensive, meat and fowls being almost double the price charged in England; milk is 6d. a quart, though sometimes it can be had at headquarters for less. It pays almost anyone to keep a cow, and there are very few good ones to be had locally. Some people import them from America, but this is expensive and risky. It would certainly pay anyone with a family to bring one out on the trooper, which can be done comparatively cheaply. A really good cow would keep a family in milk and butter for the entire tour, and if it was in good condition at the end of that time would probably fetch more than its original price. The canteen helps to keep down the local rates for groceries, which are not so very much more than at home. Fruit, except bananas, is expensive and not too plentiful. Owing to the destructive fly that ruined the crop some years ago, very little fruit is grown in the islands, and is chiefly imported from New York. The same applies to vegetables; but everyone grows all they can, and some of the officers' gardens are excellent. Poultry, too, is kept by many people, as eggs are often 3s. 6d. a dozen and sometimes even more at Christmas time. In fact, people frequently finish their tour with quite a store of knowledge on farmyard subjects.

Servants are more expensive than in any other colony except perhaps South Africa. At headquarters a good cook will demand

£3 or £3 10s. a month, and will not do any washing; in the out-stations, such as Boaz Island, they can often be had for £2 upwards. They are usually very reluctant to leave their own particular corner of the islands, and many of them have never been further than a few miles from their homes. They speak English and like to be treated exactly like English servants, and are rather free and easy in their manners. Another peculiarity is that when they go for a night out they take it, literally, not returning till nearly breakfast time next morning. Housemaids get from £18 up to £24, thanks to the Americans; and nurses, though they are usually in request only for infants, can get about the same. They have nasty little rooms built on to the bungalow outside, where they sleep, and very strongly object if the floors are damp. Some of these servants are excellent, and if one is lucky enough to get good ones they will probably remain the whole of one's time.

It is not advisable to bring out English servants; at the best it means one has to give up one of the inside rooms of the house to them, as it is quite impossible for them to sleep outside; then one is liable for their fare home at any time if they have to be dismissed. Agreements are useless; three years ago a lady brought out three English servants; all signed agreements to stay three years. Three must have been her unlucky number, for in about three months they had all left for various reasons. The lady had not to pay their passages simply because they decided to take other situations locally. Of course it is different with a nurse; one must take a certain amount of risk if there are children, and she, of course, would sleep with the child and not take an extra room. Laundresses charge about 5s. a head per family, and an extra 5s. for the household linen; few are good, and collars and shirts are washed separately by Chinamen.

Horses and Traps.—All had better be obtained locally, and very few people keep good horses, there is so little use for them. They are just used for getting about, and in a place where there are no trains, trams, or motors of any kind, one must have something. A trap that has a movable hood is most useful for both damp and hot weather, in fact a trap without a hood is utterly useless in the summer sun. The horses, like many other items, pass on from owner to owner, and so it is quite a chance how any of them are going to turn out. Occasionally some good horses are imported from the States and are eagerly bought up.

Clothing.—Men love Bermuda, as they can usually dress as badly as they please, and, except for special occasions, usually go

about in the oldest flannels. Even at official shows the top-hat and morning coat are unknown. For Government House uniform is always worn, and, indeed, men wear their uniform a good deal in this station. Kharki drill, as used in India, is worn most of the year, but for cold days a serge suit is a necessity. Linen suits are greatly worn, and can be obtained locally for 35s., but as there are not many tailors and these few are chiefly engaged making blanket coats for American girls, it is as well to take out a few suits. Flannels are quite double the home price, and though most ordinary ready-made garments are to be had, many of them have an unmistakable "Yankee" look about them. Two nice tweed suits will be required to start with, and even these will spend much of their time in a cupboard, feeding plump cockroaches. Two cotton mess-jackets are useful for the hot weather, and one of the most pressing needs is a waterproof coat that will be wearable in uniform or mufti. One without much rubber lasts best in the damp climate. All gloves must be kept in air-tight bottles and a large stock of evening ones is recommended. A few large tin-lined trunks are useful for keeping things in that are not in use. All clothing should be regularly aired in the sun.

Ladies' Clothes.—Much the same things are required as at home, only more of everything, as there are no facilities for getting things in a hurry. There are no dyers or cleaners of any kind nearer than New York, and it is cheaper to send things home. Plenty of evening frocks are required for people who intend to go about much, and it is better in this station to stay at home than to go in "dowdy," home-made looking garments, and to be conspicuously badly dressed among the crowds of beautifully-gowned Americans. Of course, officers' wives cannot compete with them, nor do they want to, but there is no excuse for the terrible garments some of them turn out in, on the ground that it does not matter in Bermuda. Several good afternoon frocks will be found essential for Government House shows, and one or two good lingerie frocks for hot weather "at homes." It does not matter how simple and plain everyday frocks are, but nothing coloured is recommended. A few warmer costumes are a great comfort, as one feels any drop in temperature much more than at home. Linens are useful for between seasons, and an old fur coat is very useful for going to dances by boat, but it is not essential, and no good furs should be brought. A waterproof coat is necessary, plenty of gloves for evening wear, but otherwise they are very little worn. High winds are frequent, so a few small hats and plenty of

thick chiffon veiling are essential both for sun and wind. Evening shoes can seldom be obtained, but excellent American shoes for other wear are not too expensive. Linen and underwear generally should not be too fragile, and glacé silk is practically useless. Satin is the best material for evening wear, and a "simple" frock for small occasions will be found most useful.

Children require plenty of strong washing garments and a couple of coats of various degrees of warmth to wear according to weather, while thin wool underclothes are advisable.

The islands lie low, are very pretty, and are covered with cedar and oleander trees, but the flowers are rather disappointing, except where cultivated. There are beautiful little bits of quite tropical scenery, and the lovely blue sea, with white roads threaded like ribbons in and out among the green background, makes a picture hard to equal.

The station is generally considered a delightful one except by people who are "unable to live without horses," and almost every one in the Corps applies for an extension, which, unfortunately, is very seldom granted.

Lectures.

THE USE OF GRAPHICS FOR ADMINISTRATIVE MEDICAL SERVICES ON STAFF TOURS AND IN THE FIELD.[1]

By Colonel W. G. MACPHERSON, C.M.G., K.H.P.

One of the chief difficulties which an administrative medical officer has to face in taking part in a staff tour is to avoid confusion and keep pace with the narratives issued by the directing staff in such a way as to ensure a proper sequence in the tactical and strategical employment of his medical units. He must be able to give a clear account of the position of these units, the state in which they are, the amount of work which they have done and are still capable of doing, the movement of sick and wounded, and so on at any hour of the day or night.

In the system of training the medical services in Austria tables are used to indicate the place of each medical unit and number of sick and wounded in it at a given hour each day; but I have found the graphic method described by Troussaint in his recently published work on the

[1] Reprinted from the *Journal of the United Service Institution of India*, July, 1912.

administration of medical services in the field[1] more useful as a method for maintaining a clear view of the situation at all hours of the day. I had an opportunity of testing this at a recent divisional staff tour of the head-quarter staff of the 4th (Quetta) Division, and a description of its use may be of interest.

For dealing with the administrative medical work during an action, and with the collection of wounded from a field of battle, graphics entered on the map of the area were employed. This map may also be of interest to officers taking part in staff tours. The original idea of it will be found in the Medical and Sanitary Reports of the Russo-Japanese War.[2]

M. Troussaint's graphic is a ruled table arranged to show the position of different medical units at any hour of the day. Vertical columns are lined off to represent spaces for each hour of the day in such a manner that they also represent the distance which the medical unit at its normal rate of movement would cover in an hour. In India, for example, where the medical units have camel and bullock transport, each hour space would represent also a distance of 2 miles, and the graphic for the day of twenty-four hours a distance of 48 miles, were it possible, that is to say, for the unit to move continuously. Horizontal columns are ruled off for each medical unit whose position and movements are to be recorded. The movement of a unit on a graphic table so ruled is simply recorded by drawing a black (or other coloured) line along the horizontal column for the unit, commencing at the hour of starting and ending at the hour of halting. A field ambulance, for example, is ordered to advance to a point 10 miles distant from its present position, the advance to commence at 9 a.m. The administrative medical officer draws his line along the column as far as 2 p.m., knowing that the rate of movement is 2 miles an hour and that the ambulance will not have reached its destination till then. The place at which it is halted may then be entered at the end of the line, as well as any other event which it is desirable to record, such as the number of sick and wounded received by the ambulance then or during the remaining hours of the day. Temporary halts during a march are indicated by an interruption of the line at the hour of the halt and its continuation at the hour at which the march is resumed.

The vertical lines for the hours of sunset and sunrise may be double or made bolder if desired. It is convenient to do so, although I have omitted this in the graphics with this paper.

These graphics were prepared during the divisional staff tour to which reference has been made, and may serve as an illustration of the use of the method by an administrative medical officer in the field. They are

[1] "*La direction du service de santé en campagne,*" by Médecin Principal de Ire Classe Troussaint. Paris, Charles Lavazelle ; pp. 217, 218.

[2] Russo-Japanese War. Medical and Sanitary Reports from Officers attached to the Russian and Japanese Forces in the Field. (Official Publication.)

modified in several respects to suit local circumstances and personal convenience, but the general principle is that of the graphic described by Troussaint.

For example, a series of conventional signs had to be devised. In this connection attention may be drawn to the necessity of definite conventional signs being adopted for the different medical units or lines of medical assistance in the field. The signs, which are used, were as follows:—

● — Regimental aid post.

⊕ — Bearer company (dressing station) of a Field Ambulance.

⊞ — Field Ambulance.

— Clearing Hospital (or group of clearing hospitals on the general map).

— General Hospital (or group of general hospitals on the general map).

— Field Medical Store Depot.

— Base Medical Store Depot.

— Sanitary Section.

— Collecting Section, Ambulance column.

— Staging Section, Ambulance column.

It should be noted that these are all units of the Indian war establishments; but they could be adapted to represent equivalent units in the British establishments. As the field ambulances of the Indian establishments are divisible into four identical sections, each capable of being moved independently, the conventional sign for the field ambulance may be made to represent $\frac{1}{4}$ or $\frac{1}{2}$ or $\frac{3}{4}$ field ambulance by splitting up the sign into $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$, thus:—

= $\frac{3}{4}$ Field ambulance.

= $\frac{1}{2}$ Do. do.

= $\frac{1}{4}$ Do. do.

Also, in order to indicate whether a dressing station, field ambulance or other unit is open for work, the sign ∧ is placed over its conventional sign, thus:—

— A field ambulance open.

— Half field ambulance open.

— A Bearer company with dressing station established.

Without this sign, the conventional sign of the unit means that the unit is waiting in reserve, closed ready to move, or not yet open after completing a march.

To return to the divisional staff tour which is being used to illustrate the use of the graphics, the narrative was briefly as follows: The division moved as an independent division from Chaman via the Gwazha Pass to Gulistan, where it concentrated on October 26, and formed the right of an army of three divisions and a cavalry division advancing against the enemy's defences. At Gulistan its lines of communication joined the army lines of communication at the Kila Abdulla, about ten miles distant. On the afternoon of October 26 a general advance was ordered, the objective of the division being the enemy's defences on the Mushlak range about 25 miles distant by way of Segi and Dinar Karez.

On the evening of the 26th the division bivouacked near the right bank of the Lora between Shuhdad and Segi. The river crossings were held by the enemy; and a night crossing was planned at an unguarded portion of the river some three miles down stream. The operation was carried out successfully on the morning of the 27th, casualties occurring only at the upper crossing held by the enemy. The division re-assembled on the left bank and advanced during the day to within four or five miles of the enemy's defences, fighting the enemy's rearguard as it advanced. On October 28 the attack on the Mushlak defences was made, the main body of the division succeeding in occupying the north end of the range after suffering considerable losses. The enemy then retired from the Mushlak line of defences, and on the morning of October 29 the staff tour terminated.

The graphics for each of these days were kept up from hour to hour during the tour and show the movements and position of the medical units from day to day, with the places where they halted or opened, the number of sick and wounded received, and the actual hours of movement and halt. Complete sequence is maintained, and it is possible to state at once the condition and locality of any unit at any hour of the day or night. By observing his graphic, the administrative medical officor was prevented from moving a unit from one place to another more rapidly than it could move in actual practice or from confusing the designation, number and locality of his units. He was saved much calculation, and was able to steer clear of complications in the strategical and tactical handling of his units. Army lines of communication medical units, in touch with the division or mobilized with it, are also, for convenience, shown on the daily charts. Their movements and positions are recorded from information which, it was assumed, would be received from the director or deputy director of medical services from time to time.

The map showing the distribution of wounded after the attack on the enemy's defences on the third day of the tour indicates a convenient

method of defining areas with a view to collecting the wounded into dressing stations and removing them to field ambulances. The casualties are distributed over the field in groups, and by drawing a line round each group, an estimate can be made readily of the medical units and ambulance transport required for each group. Further, according to the distance of the group from the field ambulance to which its wounded are to be removed, an estimate can be made of the time taken to clear the area with the ambulance transport assigned to it; or, vice versa, an estimate can be made of the ambulance transport which must be assigned to it in order to clear it in a given time. Taking each chart in detail in order to illustrate its use, one finds from the graphic of October 26 that all the divisional medical units are shown as being at Gulistan at the commencement of the day. (It should be noted that the position of each unit immediately after midnight is recorded from the information noted on the previous day's graphic in the case of the charts for October 27, 28 and 29.) Only sections A and B of No. 20 British and No. 131 Indian field ambulances are shown as open for the reception of sick of the division. All the other units were closed and ready to advance. The advance took place in the evening, sections C and D of No. 20 British and 131 Indian field ambulance moving with the advanced guard at 5.15 p.m., halting at Segi at 9 p.m. The remaining field ambulances of the division left with the main body at 7.15 p.m., and bivouacked near Shuhdad at 10 p.m., after marching about five miles. When the A.M.O. is asked at the conference at 9 p.m., to give an account of the position of the medical services, he has only to glance at his graphic for the day and read off his statement as follows: "1/2 No. 20 British and 1/2 No. 131 Indian field ambulance have been left at Gulistan with 50 and 100 sick respectively. A collecting section of an ambulance column will probably clear these to a clearing hospital at Kila Abdulla to-morrow. The other two sections (C and D) of these ambulances should be arriving just now with the advanced guard at Segi. The remaining field ambulances are with the main body and should now be about three miles on the road from Gulistan to Segi. None of these ambulances is open, and any sick with the division at present are being looked after regimentally. As a matter of fact all who were unable to march this afternoon were left with the sections of the field ambulances open at Gulistan."

Similarly the A.M.O. was able to read from his graphic any information which the general officer commanding required on the following day, October 27. Thus, a conference was held on the field at 10 a.m., and the graphic up to that hour gave the following information: "Sections A and B of No. 20 British and No. 131 Indian field ambulance opened at Segi during the night for reception of sick of the division and subsequently of the wounded, 25 sick, 110 of our own wounded and 50 of the enemy's wounded have now been received there. Sections C and D of

Page 604, 16th line from top, for "A and B" read "C and D."
,, 19th ,, ,, for "C and D" read "A and B."
,, 30th ,, ,, for "C and D" read "A and B."

the same ambulances were relieved by a clearing hospital at Gulistan, at 7 a.m. this morning. They were ordered to advance to Segi and a message has just been received to say that they started at 9.30 a.m. The remaining field ambulances advanced from their bivouacs with the main body at 5 a.m. and halted at 7 a.m. on the left bank of the river, two miles west of the S. in Sirashahar on the 30′ line of latitude (¼ inch map). As there were no casualties in crossing the river, none of these ambulances were open. The bearer companies of No. 25 British and No. 132 Indian field ambulance have been ordered to accompany the leading brigade in the advance towards Dinar Karez, and should be continuing the march now. The main body of these ambulances and No. 133 Indian field ambulance will follow the main advance and are timed to move off at 11.30."

At 9 p.m., on the same day, the record on the chart reads thus: "37 wounded came back on foot to the sections of the ambulances open at Segi; the sections, which had been relieved at Gulistan in the morning, reached Segi about 2.30 p.m., and after halting there, without opening for work, were ordered to move on to the twenty-fourth milestone on the Dinar Karez road and bivouac there. They continued their march at 6 p.m., and should consequently be approaching their bivouacs at 9 p.m. The bearer companies of No. 25 British and No. 131 Indian field ambulance opened at or near Dinar Karez at 4 p.m. and received 65 and 135 wounded respectively; 20 of the former and 40 of the latter have been sent back on foot to Segi. The main body of these ambulances reached Segi at 5 p.m. They have opened there and taken over the wounded from their dressing stations which are now closed and prepared to move on. No. 133 Indian field ambulance has halted near Dinar Karez. Information has been received to the effect that the collecting section of the ambulance column will work between Gulistan and Segi, and that the field medical store depot has been moved to Gulistan."[1]

The graphic for October 28 and the map of the areas of casualties during the fighting on that day record and explain the tactical employment of the medical units during the attack on the enemy's defences. The chart gives the following record: "The bearer companies of No. 25 British and No. 132 Indian field ambulance left Dinar Karez, at 3 a.m., with the brigade which moved to Havelock Hill during the night; halted from 4 to 5 a.m., and eventually opened under cover of the hill at 6 a.m. The main body of these ambulances remained open all day at Dinar Karez. The bearer company of No. 133 Indian field ambulance also was sent on during the night with the main body of the division to the Spinkula Hill. It moved off at 3.30 a,m., halted at 6 a.m., and eventually

[1] Acting on this information the A.M.O. of the Division sent a message to the officer commanding at Gulistan to send on reserves of surgical dressing with the ambulance column to Segi.

Page 605, 21st " " for "131" read "132."
" 25th " " for "Segi" read "Dinar Karez."

Page 606, 1st line, for "8 and 9" read "9 and 10."
,, 16th line from top. for "9" read "10."

went to the Spinkula Pass and opened there between 8 and 9 a.m. The main body of this ambulance was sent to the same spot at noon and opened at 3 p.m., taking over a large number (560) of wounded during the afternoon. Sections C and D of No. 20 British and No. 131 Indian field ambulance left their bivouacs at 10 a.m. and were ordered to advance and open at the Spinkula Pass. They arrived there at 1 p.m., and received 150 and 180 wounded respectively. They then sent their bearer companies on to the north end of the Mushlak range, where dressing stations were established about 4 p.m. and 320 wounded collected into them during the evening. Sections A and B of these field ambulances at Segi were relieved by a clearing hospital from Gulistan at 4 p.m., and were ordered to advance to Spinkula. They arrived there before midnight, but did not open.[1]

"Information was received from the lines of communication that the field medical store depot had been sent on to Segi and had arrived there at 9 a.m., also that the collecting section of the ambulance column would be sent to work between Dinar Karez and Segi."

The map of the areas of casualties shows how the administrative medical officer was able to face the problem of clearing the wounded from the field and have a portion of his medical units free to advance with the division during the operations of October 29. By the evening of October 28 he had more or less accurate information regarding the distribution of the casualties and was thus able to map out the areas shown on the map. The distribution of wounded, as they were collected into regimental aid posts or groups by the regimental medical service, formed four general groups, which are mapped off by enclosing circles and numbered I, II, III, and IV.

In Group I (the area occupied by the artillery and a covering battalion), there were few casualties, and the regimental aid posts and regimental arrangements were calculated to be capable of dealing with them and bringing the wounded back to the ambulances at Dinar Karez.

In Group II, there are the casualties collected into aid posts on and in the vicinity of Havelock Hill, from which the feint attack on the enemy's position was delivered. It was calculated that there would have been no difficulty in removing the wounded from the aid posts to the dressing stations of No. 25 British and No. 132 Indian field ambulance established in this area. The cover was good and the regimental medical service and stretcher bearers could do this, leaving the ambulance transport of the bearer companies to remove the wounded from the dressing stations to the ambulances at Dinar Karez. There were forty dandies and 160 riding mules available, and the distance from the dressing stations to Dinar Karez was four miles. The number to be moved was

[1] They would have brought with them the reserves of surgical dressings, which had been demanded from Gulistan on the previous day.

seventy lying-down cases and 202 able to be carried riding; eighty-eight slight cases able to walk found their own way back. The dandies and riding mules were consequently able to clear the dressing stations by nightfall in two journeys. The administrative medical officer had thus his mind at rest with regard to areas I and II.

The problem connected with the area marked III on the map was more difficult. It represents the area of casualties which occurred near the Spinkula Pass, when the troops advanced out of it into the open between Spinkula and the Mushlak range. Most of the casualties occurred here, and, as has already been explained, the field ambulances in reserve were all sent to this locality during the day. It was calculated that the ambulance transport of the half British and one and a half Indian field ambulances at Spinkula would not be able to do more than remove the wounded from the regimental aid posts to the west of the Spinkula Pass before night; and that only those able to walk could get back to Dinar Karez during the day. The majority of the wounded, therefore, in this area were collected into the field ambulances established west of the Spinkula Pass and remained in them during the night.

Group IV represents the area of casualties which occurred during the approach to and occupation of the north end of the Mushlak range. They occurred in the afternoon and evening of October 28, and it was calculated that nothing more could be done by night than remove them to the dressing stations of sections C and D of No. 20 British and No. 131 Indian field ambulance which had been sent on to this area in the afternoon. By nightfall it was known that the enemy was withdrawing from the Mushlak range, and it was anticipated that evacuation by way of Kuchlak would be opened up next day. It was unnecessary, therefore, to consider removal of wounded from these dressing stations, as they would be relieved by the A and B sections of No. 20 British and No. 131 Indian field ambulances coming up to them and possibly by a collecting section of an ambulance column from Kuchlak.

As there was no narrative for October 29, when the staff tour terminated, beyond the fact that the enemy had retired from the Mushlak range and that the division was to assemble for operations against its second line of defences, the movements of the medical units were restricted to bringing up to the points of assembly as many of the field ambulances as could be cleared of the wounded received by them during the previous day. A graphic for October 29 was accordingly prepared to show these details. It reads as follows: "Sections A and B of No. 20 British and No. 131 Indian Field Ambulance had reached Spinkula from Segi by midnight of October 28. After halting there for about one hour they were moved on to the Mushlak range and bivouacked for the night, ready to accompany the division in its operations on October 29. Sections A and B of No. 25 British and No. 132 Indian field ambulances at Dinar Karez left their wounded in charge of Sections C and D in the early

morning and advanced to Gazaband Pass, arriving there between 9 and 10 a.m. ready to take part in subsequent operations. No. 133 Indian field ambulance and sections C and D of No. 20 British and No. 131 Indian field ambulance were still full of wounded at Spinkula, with the dressing stations of the last two working at the north end of the Mushlak range. Information was received to the effect that a clearing hospital had been moved to Kuchlak, and also to Dinar Karez, the latter arriving in the afternoon."

It will probably be found that the above remarks are sufficient to illustrate the use and reading of the accompanying graphics, and that very little study of them will be sufficient to enable administrative medical officers to understand how useful such methods are on staff tours and on field service.

But a point which is also of some importance is the fact that all the strategical and tactical movements noted may be brought about by a few simple messages and instructions. The administrative medical officer's action, in the matter of orders, messages, and instructions, is determined by the information he receives from the general officer commanding and the divisional staff officers on the one hand, and by the director of medical services of the Army or his deputy director on the lines of communication on the other. It is his duty to keep both informed as to the state of the medical services within the division, and to transmit to the latter whatever demands he may desire to make in accordance with the situations created from time to time or in anticipation of them.

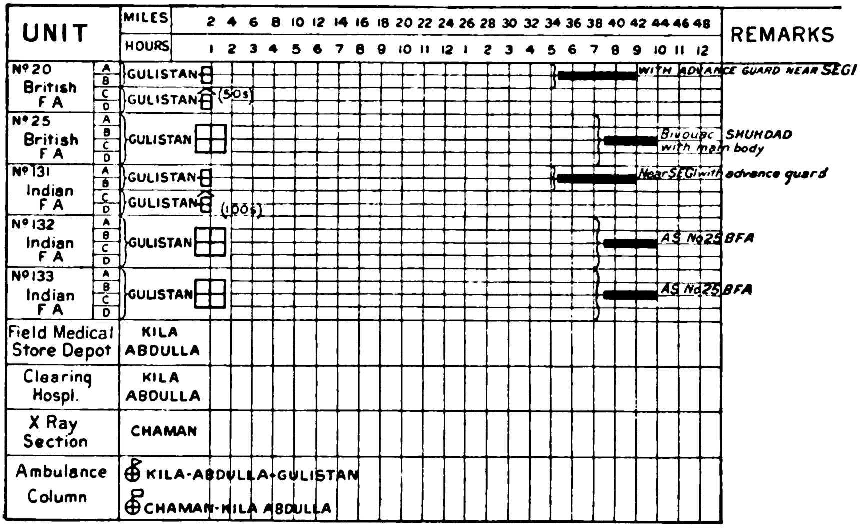
Throughout the whole of the staff tour the number of orders, messages, and instructions emanating from the divisional administrative medical officer numbered 22; they included various matters connected with supplies and sanitation as well as directions for the strategical and tactical employment of his medical units. In practice it will be found that innumerable messages, issued at intervals of a few minutes or a few hours even, while an action is going on, and entering into details of what an ambulance should or should not do, only interfere with the initiative of ambulance commanders, and besides, are apt to contradict one another and lead to confusion.

In this staff tour a demand was made for supply transport returning empty to refill at Segi, to be placed at the disposal of the medical services up to midnight on October 28, with a view to clearing as many as possible of the wounded in the ambulances at Spinkula. The transport, however, was camel transport without *kajawahs* for conveyance of serious cases, and although 400 camels were placed at the disposal of the administrative medical officer, it was found impossible to estimate the number of wounded who were capable of riding back on camels provided with pack saddles only. The idea of utilizing this form of transport was consequently abandoned, more especially as the events of the day did not indicate great urgency in removing wounded from

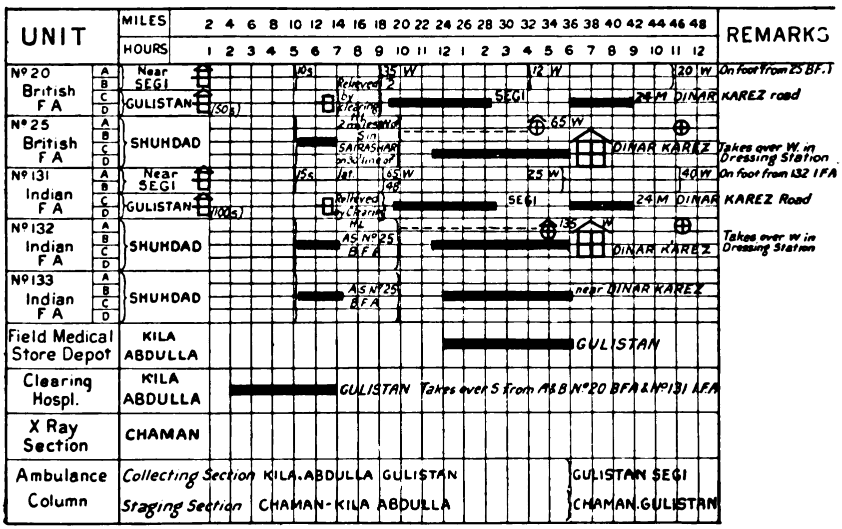
the ambulances at Spinkula. The wiser course was to leave them there until the ambulances could be relieved by clearing hospitals and ambulance columns coming up to the spot.

A general plan of the area of operations showing the position of the

October 26, 1911.



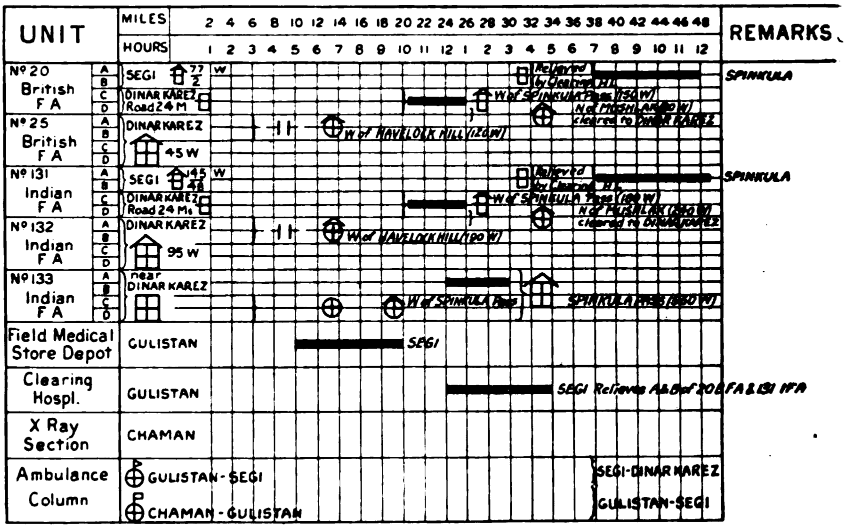
October 27, 1911.



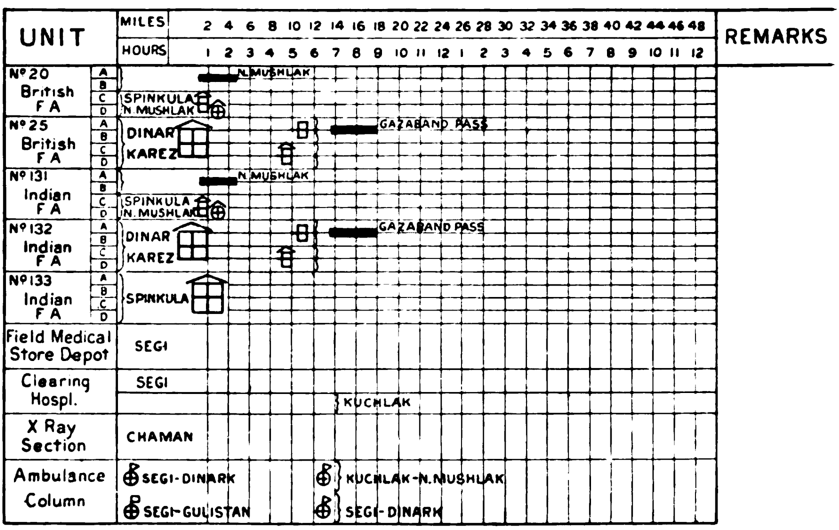
"Graphic" for October 27, for "A and B" on line of Clearing Hospital read "C and D."

divisional medical units at the commencement of the staff tour and their connexion with medical units on army lines of communications is added to the graphics and map of the area of casualties. It will enable the situations shown on these to be followed more easily.

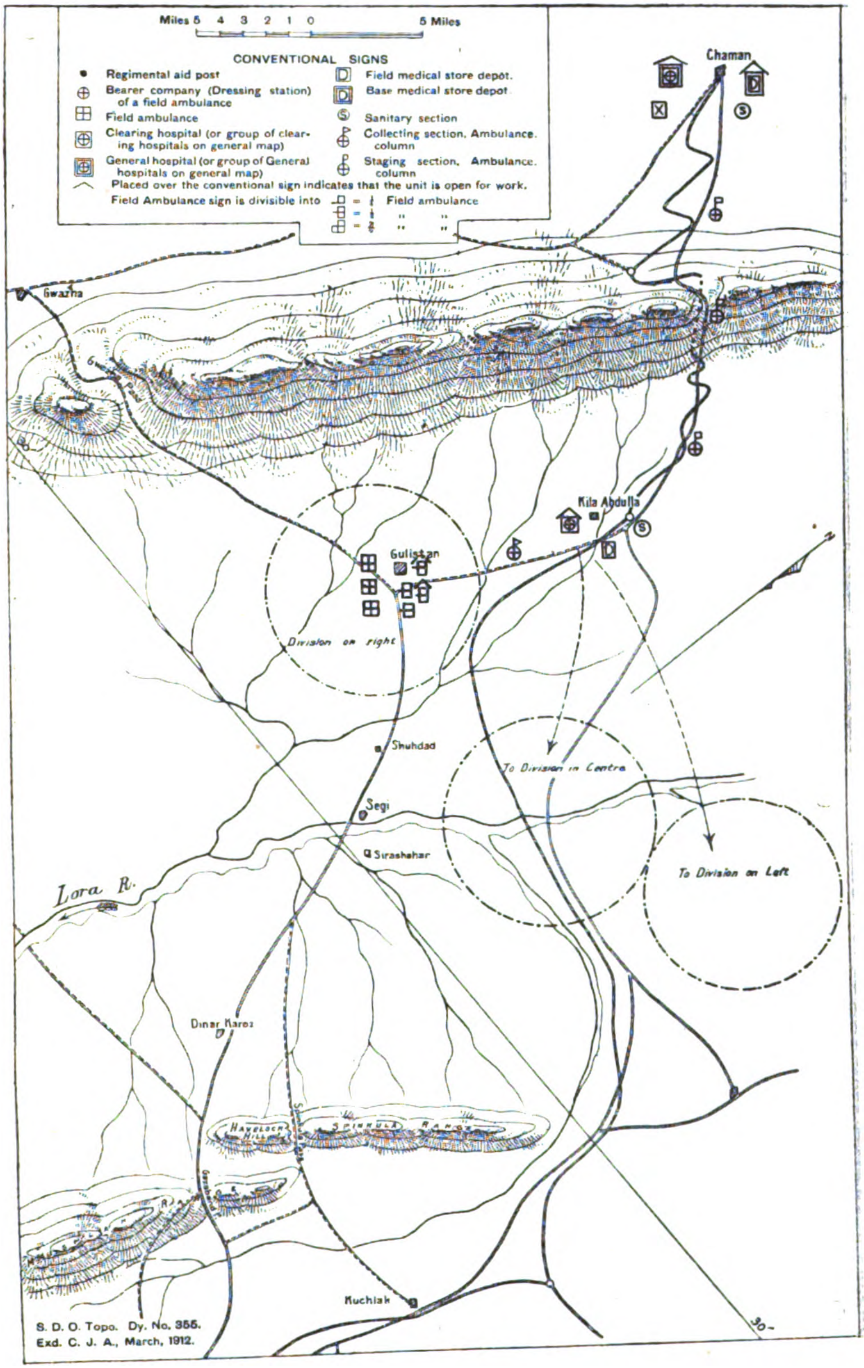
October 28, 1911.

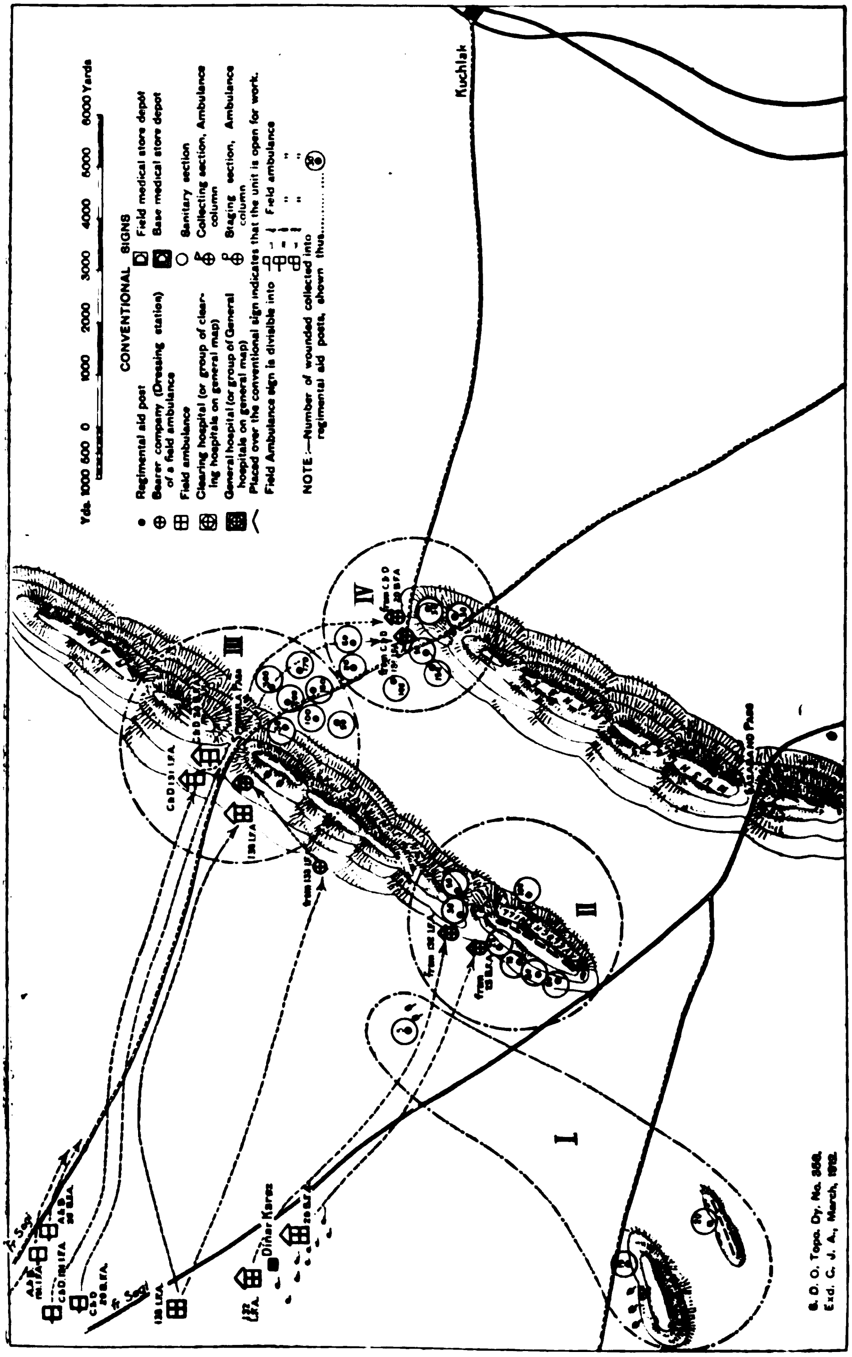


October 29, 1911.



"Graphic" for October 28, the sign ⊕ on lines of "A" of 25 British Field Ambulance, and 132 Indian Field Ambulance, under columns 32-34, should be on the lines of "C D" of No. 20 British Field Ambulance, and No. 131 Indian Field Ambulance.


Miles 5 4 3 2 1 0 5 Miles
CONVENTIONAL SIGNS
Regimental aid post
Bearer company (Dressing station) of a field ambulance
Field ambulance
Clearing hospital (or group of clearing hospitals on general map)
General hospital (or group of General hospitals on general map)
Field medical store depot.
Base medical store depot
Sanitary section
Collecting section, Ambulance column
Staging section, Ambulance column
Placed over the conventional sign indicates that the unit is open for work.
Field Ambulance sign is divisible into
Field ambulance
Chaman
Gwazha
Kila Abdulla
Gulistan
Division on right
Shuhdad
To Division in Centre
Segi
Sirashahar
To Division on Left
Lora R.
Dinar Karez
Hawelock Hills
Spinkula Range
Kuchlak
S. D. O. Topo. Dy. No. 355.
Exd. C. J. A., March, 1912.


Yds. 1000 500 0 1000 2000 3000 4000 5000 6000 Yards
CONVENTIONAL SIGNS
Regimental aid post
Bearer company (Dressing station) of a field ambulance
Field ambulance
Clearing hospital (or group of clearing hospitals on general map)
General hospital (or group of General hospitals on general map)
Placed over the conventional sign indicates that the unit is open for work.
Field Ambulance sign is divisible into
Field ambulance
Field medical store depot
Base medical store depot
Sanitary section
Collecting section, Ambulance column
Staging section, Ambulance column
NOTE:—Number of wounded collected into regimental aid posts, shown thus
Kuchlak
Dinar Karez
I
II
III
IV
S. D. O. Topo. Dy. No. 358.
Exd. C. J. A., March, 1912.

MOBILIZATION OF THE ROYAL ARMY MEDICAL CORPS UNITS OF THE FIELD ARMY AND OF ITS LINE OF COMMUNICATION.[1]

By Major T. P. JONES.
Royal Army Medical Corps.

Mobilization is defined as the process by which a force passes from a peace to a war footing. The mobilization of a unit means, therefore, its completion for war in personnel, animals, and war outfit. Some units exist as such in peace, but all R.A.M.C. units, except those of the Territorial Force, only come into being on mobilization. The procedure differs in these two classes and, therefore, the regulations for mobilization require to be read with special care as regards our corps; for instance, under the heading, "Duties of an O.C. Unit," will be found duties some of which are carried out by the O.C. of the Company, and others by the O.C. the mobilized unit; the preceding headings of "Duties of O.C. a Company, R.A.M.C.," and "Special Instructions for Units formed on Mobilization," are not explicit enough.

I propose first to go into the three subjects of Personnel, Animals, and War Outfit, in detail, and then to give a sketch of how the process of mobilization is carried out.

- *Personnel* ..
  - Serving Soldiers.
  - Regular Reservists—
    - Section "A."
    - Section "B."
    - Section "D."
  - Infantry Reservists.
  - Special Reservists (category "a").
  - Special Reservists (category "b").
- *Animals* ..
- *War Outfit* ..
  - War Equipment
    - Personal.
    - Regimental.
  - Clothing and Necessaries.
  - Regimental Supplies.
  - Medical and Veterinary Equipment.

Personnel.—The Army Medical Service Mobilization Tables have been drawn up on the principle of laying on each company of the Royal Army Medical Corps the duty of providing the personnel for certain units of the Expeditionary Force and other details, and for this purpose the numbers serving in each company are re-inforced by Reservists, Special Reservists, and Infantry Reservists. The allotment is made from the War Office. Officers are posted by the D.D.M.S. of the command, and by the War Office. Army form C, 340, which is rendered monthly, shows the

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[1] (Delivered at Woolwich during winter course of instruction for officers of the Royal Army Medical Corps.)

distribution of these officers. They are expected to be acquainted with their duties on mobilization, and on being posted are told the name of the commanding officer and the names of the other officers of their unit, and also its place of mobilization. Some units are incomplete in officers, the intention being to supplement the deficiency by civil surgeons specially engaged, in the proportion laid down in our Field Service Manual.

Warrant Officers, N.C.Os. and Men.—These are composed of: (1) Serving soldiers; (2) Regular Reservists; (3) Special Reservists (category "a"); (4) Regular Reservists of other Corps transferred to the R.A.M.C., and generally known as Infantry Reservists; (5) Special Reservists (category "b").

(1) *Serving Soldiers.*—Each company, as I have stated, has to provide personnel for certain R.A.M.C. units and other details. The number of serving soldiers required is laid down by rank in the Mobilization Instructions (table 4). These are told off by the C.O., and their distribution shown on Corps Form 1, rendered monthly. In the instructions for the preparation of this form, certain personnel, such as a chief clerk to a D.D.M.S., or A.D.M.S., and the staff of the A. M. stores, and the invalid depots are directed not to be drawn on. All those allotted are expected to be acquainted with their duties on mobilization, and for this purpose are provided with a card stating how they have been posted. These cards are of different colours, according to the sections of the Corps to which the men belong. White for the general duty, blue for the clerical, yellow for the cooking, and red for the nursing section. These cards are shown at kit inspections.

(2) *Regular Reservists.*—The number required for each unit is given in table 3, Mobilization Instructions A.M.S., they are posted and ordered to join by the Officer in Charge Records. The place where Regular Reservists rejoin the colours is known as the "place of joining." In the case of our reservists it is the headquarters of companies, not necessarily the company from which the soldier was transferred to the reserve, but usually the company nearest to the reservist's residence. The Regular Reservists consist of sections "A" "B" and "D."

Section "A."—The establishment for this section is fixed at 250. This is the section for which a man, if accepted, is attested during his first year of reserve service. He serves in it for one year. He may be re-engaged in it for another year, but only if the section is below establishment. He gets 1s. a day pay, and is liable to come up when called on, not necessarily for active service.

Section "B."—This is the section in which a man completes the period for which he was originally attested. Some men pass into it after their period in section "A," some direct from the colours. They receive 6d. a day pay and are liable to be called up for active service only.

Section "D."—This is the section for which a man re-engages after

completion of his twelve years. He re-engages for a period of four years, and receives 6d. a day pay. This section is only called up in a national emergency, when section "B" is exhausted.

(3) *Special Reservists* (*category* "*a*.")—This class takes the place of the old militia, and is distributed among eleven training cèntres. They undergo an initial training of six months and an annual training of fifteen days. They receive an annual non-training grant of £3, the pay of their rank while up for training, and an annual bounty of £1 after training. Ex-N.C.Os. of the Regular Forces who are serjeants in the Special Reserve get a £3 bounty. Establishment, 1,000. They join companies as ordered by Officer in Charge of Records at places where their kits are stored. It may be noted that under provision of A.O. 23 of 1912, Special Reservists (category "a") are allowed, if otherwise eligible, to enlist in the Regular R.A.M.C.

(4) *Infantry Reservists.*—This class consists of Regular reservists of the Infantry and Royal Garrison Artillery transferred to the R.A.M.C. and known for short as "Infantry Reservists." They are also distributed over eleven training centres. They undergo an initial training of three months and a subsequent biennial training of eight days. They are in receipt of their ordinary reserve pay, and get pay and Corps' pay of their rank during training, also a £1 gratuity after training. They join at their training centres. Establishment, 2,000. As they are Regular reservists, they are called up with sections "B" or "D" to which they belong.

The term "Special Reservist" in the Mobilization Instructions, (table 3) includes this class.

(5) *Special Reservists* (*category* "*b*").—These are members of the Territorial Force, R.A.M.C., who volunteer to come up when called for on mobilization, i.e., for the expeditionary force. They get a £3 annual grant, provided that they are present and efficient at their training of that year. The establishment is 2,985. If called up, they join at headquarters of their Territorial unit.

Details of Special Reservists (category "a" and "b") and Infantry Reservists are shown in Table 6, Mobilization Instructions, A.M.S.

Additional N.C.Os.—The number of N.C.Os. available is insufficient to bring the units up to war establishment. The deficiency is made up by special promotions and appointments made partly by the Officer in charge of Records and partly by the O.C. Company. For this reason, C.Os. are enjoined to have a sufficient number of N.C.Os. and men qualified for promotion. The claims of reservists are taken into account by the Officer in charge of Records. On mobilization, the O.C. Company through the O.C. R.A.M.C. in the district is empowered to make for each unit for which his company provides the personnel, temporary appointments as lance-serjeants and lance-corporals in accordance with paragraph 294 King's Regulations, provided the number so made does

not exceed half of the total N.C.O. establishment of the unit (Authy. R.O.L. 338, dated September 20, 1911). The selection is made in advance and the eligible N.C.Os. and privates are posted to the unit accordingly in Corps Form 1. These appointments are unpaid and are temporary, pending the publication of Corps Orders.

Animals.—In the event of a general mobilization, horses are provided under requisitions of emergency. Units which require horses will telegraph to the G.O.C. in charge of Administration of the command in which they mobilize, the number and classification of animals they require. C.Os. are responsible for having parties ready with the necessary gear, to proceed where directed and take over those horses at any time after mobilization is ordered.

War Outfit.—The war outfit of a unit consists of: (1) War equipment; (2) clothing and necessaries; (3) regimental supplies; (4) medical and veterinary equipment. Full details of these are given in our F.S. Manual.

(1) *War Equipment.*—This consists of the whole of the equipment with which a unit takes the field and comprises both that portion of the peace equipment which is retained on mobilization, and the mobilization equipment, i.e., the additional equipment required to enable a unit to take the field. It is partly personal and partly regimental. Personal equipment is the ordinary equipment of the soldier, in the case of men serving it is held by their company; in the case of Regular reservists it is kept in mobilization stores at company headquarters; and in the case of Special and Infantry reservists it is kept in mobilization stores at their training centres. Regimental equipment consists of guns, vehicles, saddlery, stores, &c., and for a R.A.M.C. unit would consist of all the ordnance stores held for it on mobilization. None of it is held in peace time. With the exception of the medical comfort panniers, it is always stored at the place of mobilization. The place of mobilization of a unit means the place where its mobilization is completed. It must be distinguished from the place of joining which, as I have stated, means simply the place where the Regular reservists join. The place of mobilization of a R.A.M.C. unit depends, therefore, on the place of storage of its ordnance equipment, which in turn depends on the accommodation in the ordnance depots. This is necessitated by the bulky nature of the stores. No ordnance equipment is stored for ambulance trains, hospital ships, medical store depots and sanitary sections or squads. Details of war equipment are found in Mobilization Store Tables A.F.G. 1098 series.

Medical Comfort Panniers.—These are held by the R.A.M.C., except those for line of communication units which are located at the Supply Reserve Depot, Woolwich. They are forwarded to the place of mobilization without requisition. The contents are periodically turned over.

(2) *Clothing and Necessaries.*—In the Field Service Manual there is

a list of the kit our men take on mobilization. This list is taken from the Clothing Regulations. The serving soldier is already in possession of most of this kit; the special articles for active service, namely, brassards, clasp knives and field dressings are stored with the mobilization equipment at the place of mobilization of the unit.

Clothing and necessaries for Reservists are stored with the equipment at the place of joining as directed in Clothing Regulations, i.e., with the exception of certain articles which are ordered to be kept in bulk. Each man's kit is kept in a separate compartment over which hangs a card with his name, unit, &c., the Officer in charge of Records being responsible for the necessary information for keeping this up to date. A turnover is arranged for. A complete new kit is not stored for Special Reservists as a certain amount being kept for their annual training, only the balance necessary to complete it is held in mobilization stores. Kits for men 10 per cent. in excess of the requirements of the units are stored in order to provide for casualties, and these men are ordered to join by the Officer in charge of Records. Brassards, clasp knives and field dressings for reservists are stored with the mobilization equipment of the unit in the same way as for serving soldiers. Brassards and field dressings for officers, and brassards for lady nurses are also stored there.

(3) *Regimental Supplies.*—These comprise the rations and forage to be carried by a unit as a reserve for its use in the field. They are part of the war outfit, and must not be confounded with the field service rations which a unit draws from the first day of mobilization.

Regimental supplies consist of :—

One day's emergency food.

One day's preserved meat and biscuits.

Two day's groceries.

One day's corn ration.

One bale compressed forage per wagon.

The detail is given in war establishments and in the allowance regulations. Regimental supplies are drawn from A.S.C. depots at the place of mobilization, except emergency food, which is issued without indent from the Supply Reserve Depot, Woolwich. C.Os. are empowered to purchase two days' groceries and one day's oats if these are not available in stock. G.Os. C.-in-C. are responsible that the stock of preserved meat, biscuits and compressed forage is sufficient to meet the requirements of units which mobilize in their commands.

(4) *Medical and Veterinary Equipment.*—Medical equipment is held in peace time in charge of the R.A.M.C. Instructions for mobilization A.M.S. state where this is held for each unit. On mobilization being ordered, this equipment is forwarded to the unit at the place of mobilization without requisition. This equipment is subject to turnover to prevent deterioration and that in charge of districts is inspected twice yearly. It is stored separately and labelled for each unit. There is a

tendency to still further decentralize this equipment and to have it as near the place of mobilization as possible, provided that arrangements can be made for its storage and care. Veterinary equipment is held by the A.V.C. in a similar manner.

Having now dealt with the subject of providing personnel and animals, the storage and manner of obtaining war outfit, the process of setting the machinery in motion remains to be considered. Mobilization entails a mobilization of all the military forces in the United Kingdom. In a partial mobilization, special instructions would be issued from the War Office detailing the force to be mobilized and the procedure to be followed. What I have to say now deals with the arrangements for a general mobilization.

Preparatory Measures.

Mobilization arrangements are governed by the regulations for mobilization, the Expeditionary Force Tables and also by the Mobilization Instructions, Army Medical Service. G.Os. C.-in-C. are responsible that preparations are made in peace time in accordance with these regulations, and to this end local mobilization orders are drawn up by officers commanding stations and by officers commanding units, depots and companies, R.A.M.C. Station mobilization orders deal with arrangements for providing the supplies and the additional accommodation which will be required both for reservists joining and for units mobilizing at the place. In estimating the available accommodation, 30 per cent is added to the authorized peace occupation of the barracks, and provision is made for the remainder in camps, schools, &c. Station orders also contain arrangements for necessary moves and include time tables to regulate the drawing of mobilization equipment and the hours for medical inspections, &c. The mobilization orders of a unit are detailed orders prepared in peace time to take effect immediately on mobilization and should provide for every contingency. They should be complete, requiring only the names of officers and the dates to be filled in. In the case of a R.A.M.C. Company, mobilization orders would comprise such matters as arrangements for despatching personnel to their units; accommodation for clothing and equipping of reservists joining; transfers of duties; medical inspections of corps in the garrison; despatch of medical and surgical equipment held on charge; preparations for R.A.M.C. units mobilizing at the station. A distinct set of orders should be prepared for these R.A.M.C. units when they arrive, which should include the time table and mode of drawing mobilization equipment, rations, &c., the dates on which they should be completely mobilized and orders dealing with their administration while in the station.

Procedure on Mobilization.

The first day of mobilization: This is the day following that on which the order to mobilize is issued from the War Office. This order

is telegraphed to G.Os. C.-in-C., and to Officers in charge of the Records. On receipt of this order, G.Os. C.-in-C. will inform all officers concerned. District Commanders will order mobilization posters to be placarded throughout their district.

Duties of an Officer in charge of the Records.—The Officer in charge of the Records R.A.M.C. issues notices to Reservists to join at their alloted stations, but on a general mobilization all Regular Reservists join at once without waiting for any orders. They already have their travelling warrants. To cover casualties, a margin of 10 per cent. above actual requirements is added, as I have mentioned already. The Officer in charge of Records receives from the O.C. Company daily during mobilization a nominal roll (A.F. D. 442) of reservists who have been sent to each mobilized unit. Acting on this, he sends the Reservists' documents to their unit and passes on the Form to the Paymaster so that there may be no delay in the men's pay and remittance to their families. He also, as I have stated, makes the promotions and appointments necessary to bring units up to war establishment.

Duties of an O.C. Company R.A.M.C.—The duties of an O.C. Company R.A.M.C. are: (1) Concerning his own N.C.Os. and men; (2) concerning reservists.

On general mobilization being ordered, officers on leave and soldiers on furlough will, without waiting for further orders, return to duty immediately. The C.O. orders a medical inspection of all ranks. He parades his parties allotted to units to see if their clothing and equipment is correct and arranges for the exchange of any articles of personal clothing that are not fit for three months' further wear. This is done at the public expense, unless an issue of clothing allowance is due, in which case it is done at the soldier's expense. He arranges for the storage of their surplus kit (a list of articles to be taken should be posted on the notice board). He arranges for the transfer of their accounts and despatch of their documents to their new units. These documents, together with a nominal roll, are taken by the conducting officer or N.C.O., if there is one, if not, sent by post. A final parade is held in marching-away order, and the parties are despatched to their units in accordance with the time tables as laid down in local mobilization orders. It should be noted that these parties of serving soldiers really act as advance parties for the purpose of drawing the equipment, &c., for the units mobilizing.

Now with regard to reservists. In accordance with his local orders, the O.C. Company arranges for rations and accommodation for reservists joining. He orders a superficial medical examination of them as they join, which they may be expected to do from the second day. If they pass this, he clothes, equips and despatches them to their units in small parties under an N.C.O. Those found unfit are dealt with as directed in paras. 162 and 196 Regulations for Mobilization. This preliminary

examination is specially enjoined to be of a superficial nature; on arrival at their mobilized units reservists are medically examined again. The O.C. Company has all the kit of the reservists marked as it is issued. It must be remembered that each reservist is told off to a particular unit and that his kit is ready for him. The O.C. Company obtains from them their life, identity and reserve certificates which he forwards to their paymaster (Paymaster No. 2, Aldershot). Reservists can leave their plain clothes at the place of joining, but at their own risk. Each evening the O.C. Company sends to the Officer in charge of Records a nominal roll by units of the reservists he has despatched, also stating names of any found medically unfit. On receipt of this, the Officer in charge of Records acts as I have already described.

As each party leaves, the O.C. Company telegraphs its time of arrival and whether it has been rationed for the day, to the O.C. the unit to which it is proceeding.

In addition to these duties the O.C. Company must, as detailed in local orders, arrange for transfers, local duties, despatch of equipment held on charge, and make preparations for the arrival of mobilizing units.

Duties of an Officer Commanding a R.A.M.C. Unit formed on Mobilization.

This officer proceeds at once to the place of mobilization, he has nothing to do with the place of joining, and takes over command of his personnel, both R.A.M.C. and A.S.C., as they arrive. Their accommodation has already been arranged for, and ration indents should have been submitted in advance. He draws his equipment and regimental supplies as laid down in the local orders of that place. About drawing equipment, it must be noted that the regulations state that the counting of the A.O.D. must be accepted if there is no time to check the stores. It must also be noted that equipment need not necessarily be taken up to the camp of the unit. The stores would technically be drawn by taking them over at the ordnance depots where they would be loaded up on trucks or steamer, but all this would depend upon circumstances. The same would apply to bulky medical stores. On receipt of orders the C.O. sends a party of his A.S.C. personnel to take over his horses. He sees that his medical and veterinary equipment has been received and also his medical comfort panniers (all these are sent to him direct without requisition). He has a final careful medical examination made of his reservists. Men found unfit at this stage are sent back to their place of joining to be dealt with there. He inspects all clothing and equipment to see if it is properly marked and arranges for the exchange of unserviceable garments and boots if this has not already been done at the company's headquarters. The special articles issued on mobilization, which are field dressings,

brassards and clasp knives with lanyards, are drawn from the ordnance depot together with the other mobilization equipment. The O.C. also forwards to the Officer in charge of Records the medals and the wills of soldiers, the regimental conduct sheets and any documents not required by the unit; a nominal roll, as directed in para. 173, Regulations for Mobilization, will accompany the medals. He sends A.F. D. 418 (separation allowance), and A.F. O. 1796 (allotments of pay) to the Regimental Paymaster, No. 2, Aldershot. He issues an active service pay book to each soldier, verifying the entries on p. 3, sees that all ranks have identity discs and issues emergency food. Every evening he reports daily progress to G.O.C.-in-C. through the proper channel. If his rate of progress is keeping pace with the time table embodied in local mobilization orders he telegraphs "mobilization normal," if he anticipates that he will be earlier than the time-table laid down he names the date, if he thinks he will be late he explains the delay. He telegraphs when mobilization is complete, giving at the same time the strength of the details left behind under the headings:

(1) Fit.
(2) Unfit—(*a*) Owing to insufficient training.
(*b*) Owing to being under age (20 years).
(*c*) Medically unfit for service.

Echoes from the Past.

CONCERNING THE ARMY MEDICAL DEPARTMENT.

By Surgeon G. J. H. EVATT, M.D.

Attached to 25th (King's Own Borderers) Regiment, Jubbulpore, India, February, 1875.

[Brief Note by the Writer of the Pamphlet.]

This pamphlet, a fourth edition of which appeared in 1883, was written by me at Jubbulpore, India, in the beginning of 1875. I had joined the 25th (K. O. Borderers) Regiment as Regimental Assistant Surgeon in June, 1866, and was still with them in 1875, attached under the compromise system existing at that time.

Deputy-Surgeon-General Crawford, afterwards Surgeon-General Sir Thomas Crawford, Director-General Army Medical Department, was then Principal Medical Officer at Umballa. He was good enough to write to me and say he would be responsible for all expenses connected with the circulation of the pamphlet. This kind offer, however, was not accepted.

As I had entered the Service on March 31, 1865, I was in my ninth year of service when the pamphlet was written. I had visited the French Army in 1865 to inquire as to the Medical Service of that country, and had seen the

Turkish Service in Bagdad in 1873. The pamphlet may be useful to students of organization as showing the conditions existing in the spring of 1875.

GEORGE J. H. EVATT, M.D.,
Surgeon-General (Retired).

Junior United Service Club.
September, 1912.

SECTION I.—INTRODUCTORY.

(1) I propose in the following pages to notice some points concerning the Medical Service of the British Army, which seem worthy of examination, and to put forward some suggestions concerning this important branch of Army organization.

I believe that advantages and not drawbacks result from the statement of individual opinion on this as on most other subjects, and that in the end progress is achieved rather by selecting the good points from many sources than by adopting *en masse* the views of any single individual. If such be the case, it is necessary that individuals should state their opinions for public criticism and comment.

(2) It would be mere waste of time to dilate here on the advantages that should accrue to a small and expensive Army like ours from having its medical service in a highly efficient state. No Army in the world has more need of a thoroughly good Medical staff than ours has. Other Armies, in addition to having unlimited supplies of men, never serve out of their native countries, never campaign out of temperate climates, are never exposed to deadly diseases, and the strain of war is the only strain their Medical staff is called on to bear; but for us, in addition to campaign risks, we have ever to contend against tropical climates and epidemics of the most fatal character, not once in a generation, but every year and unceasingly. Quartered in every latitude of the globe our soldiery are continuously fighting in a campaign more fatal in the long run than a bloody war, and to assist them in this combat as well as in the field of battle our Medical Department exists. Whatever means its efficiency means more efficiency for the Soldier ; whatever weakens its good working condition, acts prejudicially against him in like manner.

(3) Every Military Commander who has risen to any high place in his profession has recognized the importance of this fact, and its bearing on the *moral* as well as the *physique* of his soldiers, and he can no more ignore the health state of his forces taken as a whole, than any single individual can despise his individual health as a factor of great importance in his successful career in life. Even as

that individual requires to take precaution and exercise forethought to protect his constitution in everyday life, so must the Military Commander or Administrator protect the Army of which he is the thinking head. To have an efficient Medical corps highly trained, thoroughly organized, well acquainted with their duties, and willing to devote themselves in every way to the good of the service, is useful in even the large Armies of the Continent serving in temperate climates; but for us, with small and costly Armies serving often in pestilential climates, it is an absolute and an imperious necessity.

(4) Let us read our national Military History, that great storehouse rich in warnings and information alike for the Military physician as for the Military commander; let us lay to heart the stern lessons it contains of previous failures and mistakes, and we will find that the lessons of Walcheren in 1809 did not prevent the disasters in Turkey in 1854-55; nor was there any reason until the great reforms were made in 1873 why what was true in 1855 might not have been true in 1875.

The question still comes home to us very thoroughly to-day as to the efficiency of the Medical service of the Army, and we may ask, have all the lessons of the past been taken to heart, the good points singled out and developed and the weak points removed and obliterated? Have we taken to heart the sad warnings given us only too often in the past, or do we still keep running in the old groove to meet like disasters in like situations again? There were excuses in 1854-55 after a long European peace; there will be none in the future. 22,000 dead men lying before Sebastopol and at Scutari are surely a lesson sufficient for all time. Yet to show how slowly and with what caution we act, it was not until to-day a limit was placed to the existence of the system mainly to blame for these bitter memories.

(5) Ever since any Medical aid was organized for our Army a century and a half ago, the system known as the Regimental Hospital System has been the principle on which it has been worked. Existing at first in a very rude and primitive form the medical arrangements of the old armies that fought in Germany and the Low Countries were poor and incomplete to a degree, and since then gradually the organization and condition of these arrangements have been changed and improved; but what is called the Regimental Hospital System remained the basis and the rule of working until the promulgation of the Royal Warrant of March 1, 1873.

That mode of working the Medical aid of the Army, which sat like an old man of the sea upon the shoulders of the service for so many years has now disappeared, and let us hope for the sake of the Empire we shall see it no more. It is a true saying that the first sentence of the Warrant of 1873 abolishing Regimental Hospitals was written seventeen years before the Crimea, but such is the conservative tendency of our Army that it took the long intervening lapse of years to complete it. Let us trust that work so slowly done has been very surely done.

(6) Such a change as abolishing these Hospitals could not take place in an Army like ours, which lives on tradition, without many officers of the Military Department of the Army and some officers of the Medical Department regretting the step, and it seems advisable to note here the features of that system, whether good or bad, and to weigh them against each other, that seeing the good points we may cherish them, and noticing the defects we may avoid them.

Section II.—The Regimental Hospital System.

(7) The Regimental Hospital System was a system by which the sick and wounded of the Army were treated in separate hospitals, each an adjunct of either a Regiment, Battalion, Battery or Detachment, the Military Commanders of which were responsible for their efficiency. The Medical Officers who treated the Regimental sick were themselves commissioned specially in the several Regiments or Battalions and confined their duties to treating their corps sick only. However numerous the various Regiments or Batteries or Detachments in a Garrison were, each of them had their own separate Hospital establishments, whether as regards buildings, offices, attendants, instruments or medicines. The responsibility for the correct working and proper condition of these Hospitals rested with the Officer Commanding each Regiment or Detachment; and no person had any power or authority to interfere with them in any way save himself. To the Medical Officers who acted under him were delegated the prescribing duties for the sick, but beyond this no further responsibility rested upon them. The Regimental Commanding Officer was responsible for the cleanliness and order of the Hospital, and being so caused the subalterns on duty to visit the Hospital daily and report to him of its condition and general state. He chose the Hospital Serjeant in conjunction with the Medical Officer, and by his sanction the

orderlies and attendants were allowed to be employed in the wards, and by him they could alone be withdrawn. Over them he alone exercised control, and it was not competent for the Medical Officer to check in any way either their or the patients' irregularities, except by notifying them to the Commanding Officer.

By him all the duties of the Regimental doctors were detailed. The Regimental Adjutant kept the roster for the Subordinate Medical Officers and through him every order in connexion with the Hospital was issued. The orders for the interior economy of the Hospital, regulating the hours of rising and going to bed of patients, the hours at which they should walk out, and in fact every order except those referring to the medical treatment issued from the Commanding Officer. To obtain a new key to the door, or a new pane of glass for the windows, he alone could apply to the Supply Departments, and on the march the Regimental Quartermaster arranged for the transport and carriage of supplies for the sick, and under the control of the Commanding Officer assigned the locality of the Hospital.

(8) Simply the Hospital authority and organization was centralized in the hands of the Regimental Commanding Officer already very fully employed in other duties, and it depended very much on his personal tastes how much or how little he actively interfered, one Commanding Officer being constantly directing every petty detail, while another let matters take their own course to a great degree. To whatever extent they interfered or did not interfere, officially they alone were responsible for the state of the Hospital; they alone were praised or blamed for the condition, and while such was the case it was but simply right that they should have the fullest authority in its working.

Whoever is responsible, to him give the power. Blame him if he fails, applaud him if he succeeds. In this way only can order be preserved. The Commanding Officer's view of the case was perfectly and strictly correct, and *imperium in imperio* can never be allowed in a Regiment; one man must be responsible and he alone. Under such a constitution the Regimental doctors had nothing to do save prescribe for the sick; they shifted to the Regimental Commanding Officer, the Adjutant, and the Quartermaster all questions as to organization, discipline, order, transport or administration, and lived a life wholly apart from all such questions as these, or if they did interfere it was a work of supererogation, and might as such be at any time resented by a Commanding Officer of strict views.

(9) For the medical treatment, the Regimental doctors were responsible to the Inspecting Medical Officers, who from time to time visited the Hospital, and looked into the records of treatment, the dieting, and such like subjects. Before the Crimean epoch, the Medical Officers of the Army were almost wholly Regimental, there being very few Medical Staff Officers, but since then these officers had very largely increased, and were employed in filling up temporary vacancies in the Regiments caused by sickness or leave amongst the Regimental doctors. They carried on the Regimental routine like the officers whom they relieved, and although their postings were regulated by the Inspecting Medical Officers, once attached to a corps these Staff doctors were solely under the orders of the Regimental Commanding Officer.

(10) Such was the system, venerable it is true by long existence, which terminated in 1873. It had some advantages, it had many drawbacks, and both one and the other we will now consider.

(11) The supporters of the Regimental system claim for it advantages on three grounds: (*A*) That each regiment had its Hospital perfectly complete at all times and was perfectly independent of the Army in consequence; (*B*) that the Medical Officers being constantly with the Regiment learned to know the men; and (*C*) that it formed a pleasant home for the Medical officers. We shall inquire into the accuracy of these statements.

(12) (*A*) That the Regiment under this system had its hospital always ready and was quite independent on this head of the rest of the Army. If this were true, it would settle matters at once in favour of the system. Unfortunately it is not so. One cannot too often remember that the old Army systems have undergone a great change of late years. In none more than in the meaning of the word "Regiment." In the old days every one knew a Regiment meant 800 men, neither more nor less; it was as strong as the actual number of men serving with the colours made it, but no stronger. Accordingly there existed a given fixed data to work upon in preparing equipment, supplies, and medical aid while the regiment was serving in ordinary barrack life. It was known that the sick percentage was generally so much, and needed so much provision for them. The tradition of the Peninsula which clings to our Army with frightful pertinacity shows that even in those days when a regiment was a known number, the system failed if a corps was heavily engaged, and such like. But what is a Regiment to-day? The Army has ceased to be Regimental in the old sense. The Brigade is now the unit, and the long service customs of the

old Army are disappearing. The rule for the future will be small numbers with the colours and large reserves. There will be in the case of war the men from the linked Battalion joining the fighting Battalion, the Army Reserve men, and the Militia Reserve men, and amongst all these additions what will be the meaning of the word "Regiment"? It will be in peace, 400, 500, or 600 men, while in war it may rise to 900, 1,000, or 1,200. It little matters for the Military Commander how much it is, provided the men are armed and dressed. Food supplies are not borne regimentally, and the Army strength will always be estimated for, apart from Regimental strength. But it is quite the reverse with the Hospital system. The Hospital supplies and attendants, if they are to be supplied and borne regimentally, must have a definite data to work upon, and if the Medical Officers and equipment be based upon 400 men, it will be insufficient for 1,000 men in war, and if based upon 1,000 in war, it will be too much for 400 men in peace; 400 men means say 20 sick, 1,000 men means 50 sick. Such variation of strength matters little to the Military Commander, as regards his Military duties; if food be obtainable all goes well, but in the Medical arrangement it means disaster from want of proper supplies and sufficient medical aid. In noting the drawbacks of the system further on, we will show that even if suitably estimated for, the first month's campaigning threw out all calculation.

(13) (*B*) As to the Medical Officer "knowing the men" as it is called, there is something to say. The Regimental advocates say it is a great thing to know the constitution of the men, and to understand their varying temperaments. There is no doubt advantage to be gained from knowing the men. But we have in this argument another survival of old Regimental tradition. All Military people know that in the old times, in the days of continuous service, a Soldier joined his Regiment and served with it uninterruptedly until he died, or was worn out, or invalided. This system was stopped some forty years ago by introducing the twenty-one years' service rules. In 1847 the limited enlistment for ten years came into force, and now we have come to three years' service with the colours, and three years with the reserve. Each succeeding alteration meant greater change of men individually. The truth is that long service systems have been so intolerably expensive, and in the end so weak in the field, that small cadres and large reserves will be more and more the rule. Soldiers will not now live their whole life in a Regiment as they did in the "good old days," and with a three years' service with the colours, and with streams of men

coming in and leaving yearly the Regimental ties of the past become quite weakened and disappear. If the Pre-Crimean doctor knew the Pre-Crimean Soldier, it was because both served long years, in fact lifetimes together. To-day we have changed all this. Linked Battalion men, Army Reserve men, and Militia Reserve will all pass through the Regiment, and all such intimate knowledge of the men will be impossible. To-day men leave their corps without hesitation either to volunteer for service in India, or for any purpose that suits their inclination. In the old days such occurrences were very rare.

(14) Further, in the old Army, when the men were tied for life to the service, "*malingering*" or shamming various ailments was common, and indeed rose to the dignity of fine art. A soldier knew he could not escape from the service unless he was sent out by the Medical Officer as an invalid, and accordingly he shammed sick continually. It is said the old Medical Officers became experts in detecting this line of conduct, and an officer might make a reputation by his skill in detecting the schemer.

To-day malingering simply does not exist. Short service, pleasanter lives, more rational treatment and the ease of joining the reserve, removes from the soldier the necessity of scheming sick, and it is really never seen. It was the bugbear of the old Army, and the diamond cut diamond stories of clever shammers and still sharper doctors are now merely traditions of the mess tables.

(15) Again, in the old days, the Medical History sheet established in 1859 did not exist. A more inquisitorial or more useful document does not exist in the Army. In it the age, weight, strength and every possible medical information about the man is entered, and from time to time the diseases he suffers from, their treatment, causes, &c., &c., are also entered. No civilian doctor has such a record of his patients.

It is truer than even a patient's own statement, for it cannot err, nor can it take up false ideas of what his former sicknesses were, as patients often do. The old Army had not this document. Armed with it a man can be sent to any Regiment or Hospital and his Medical Officer sees at a glance his whole Medical History. Let us then be candid. "Knowing the men," even in the old days, meant knowing the Regimental gossip and such like chit chat with which in weary stations and on dull evenings we whiled away the time. The Medical Officer could chime in with his contribution to the general stock, but the knowledge was not necessarily medical in its aspects.

(16) Further, it is necessary to remember that with the unification system one Army Medical Officer will still be "attached" to each corps for five years with power of re-appointment.[1] He will be the sanitary adviser of the Regimental Commanding Officer, will see the men of the Regiment daily, and will, when they are sick, have them sent to the Station Hospital, sending with them their Medical History Sheet and such special information as may be necessary to be given to the Medical Officers there. While in Hospital the Medical Officer of the Battalion he belongs to can see him constantly if necessary, and can advise as to his treatment with the Medical Officers of the Hospitals. His officers can see him constantly also, and his comrades at very frequent intervals. When one remembers that civilians of his class are treated always by strange doctors in Civil Hospitals, and by persons not bound to them by the strong Army ties that bind us to the soldier, we must acknowledge the soldier has the best of it.

(17) Besides, even in civil life nowadays change of physicians, owing to travelling, visiting the seaside, consulting leading men in London is not only common but frequent, and in the old Army life the Regimental doctors themselves changed at times. Of late years even under the Regimental system it became perfectly common and even frequent. This we will now discuss.

(18) (*C*) That it forms a permanent home for the Medical Officers of the Army. In discussing every phase of this Regimental Hospital subject, it is necessary to remember we are living in 1875, and not in 1835, and that the ideas that prevailed then in the Army do not many of them now exist. In the old days the Regimental tie in the Army was very strong, if tradition speaks truly. Officers and men lived longer together. Second Battalions did not exist to cause change of Officers. Great camps like Aldershot and the Curragh were not. Indian Garrisons were fewer by far and about one-third of the present strength. Foreign service tied men down to their station more closely, for steam did not exist, and railways in England did not carry every one to town as they now do. The Colonies occupied many Regiments in far detached posts, and Canada, the West Indies, and the Ionian Islands had not had their garrisons withdrawn and concentrated at home. The Army is larger in point of numbers. The ease of interchange is infinitely greater, and it is certain the Regimental bond is weaker.

For the Medical Officers it certainly was much weakened, and it

[1] This system was afterwards abolished (Army Circular Clause 104 of 1876).

was exceptional to see a Medical Officer remain as in the old days with one Regiment for any long time. Before the Crimean War Medical Officers grew grey in the same corps. Since then their average service has been three years. The large increase in the Medical Staff not attached to Regiments is well known to all Military men, and the gradual separation of Medical Officers from their corps has been quite apparent. In the old days they could not exist apart from their Regiments as they were too few and too scattered. To-day it is quite the reverse, and there is much desire for a closer union on their own basis as Medical Officers simply.

(19) The Regimental system of our Army is good, very good, but it was never intended for the Medical Officers. They are outside its grasp, and the union although useful in the old days is now drawn to a close. In truth, the majority of the Medical Officers admire so much the Regimental organization that they desire to apply it to themselves. Regimental life by all means, but it should be a corps of our own. To-day, when the system of Regimental Hospitals is dead and the tie that bound us to our old Regiments is severed, not one word shall be said against the good kindly comrades with whom the best days of our life were spent; it was the system and not they that were at fault. But admire as we may Regimental esprit de corps, we must have felt that we were hardly in its grasp, and the disaster of the Crimea had taught us all that we were carrying out a failing system that would not work.

(20) To be with a Regiment and still not to be of it, never to represent it, to be at the whim often of varying Commanding Officers, to have questions raised about precedence, to be alienated by petty bars from our brother doctors, to wear uniforms of corps to which we in no real sense belonged, to be members of an important and every day rising profession and still be at the bottom of Regimental Lists and wholly without a centre to work round in the service; to submit to these things was intolerable. Better, far better, to stand forward as the Army doctor pure and simple than to wear a travesty of the uniforms of the finest corps in the service. Better the simplest style at one's own Medical Mess than the most elaborate display where one's authority was nought and one's seniority ignored.

(21) Army doctors while serving in Regiments have constantly, always I may say, drawn round them the respect and the love of the best spirits in their Corps. The friend of the soldier, the friend of his wife, the kindly fellows who felt for all, I am certain they will be missed, but the separation must come, and though the pang

is painful at first, it will be the best for the service in the end; of that I am quite certain. Whatever our organization it cannot change our nature, and on new foundations truer and better, the old likings will grow up again, and all petty questions be terminated for ever. Thrown as we are in constant intercourse with the officer and the soldier, with them more than any other Department can possibly be, there must always be many bonds tying us together, but they will not be the painful yokes the Regimental system could be made in the hands of Commanding Officers who were not nice, and the interchange of friendships will be truer when working on the Army basis only. Together at home and abroad, in the field and in cantonments, in the troopship or on the march, there need be no fear that we will grow up with any sympathies apart from the service.

Section III.—Drawbacks of the Regimental System.

(22) We now turn to the other side of the picture and note the drawbacks of the Regimental Hospital System. The Medical Corps of an Army exists on two grounds: one that during war, when the safety of the State depends upon the efficiency of the Army, there should be a thoroughly good Hospital system with officers and equipments complete, assisting the soldiers in their struggle with wounds and sickness; and the second, that during peace the best medical advice and the best medical appliances procurable should be available for the soldiers in their sicknesses, and that competent instructors should exist to advise the Military Commanders on questions concerning their health and physique. Viewed from either of these standpoints the Regimental system in my opinion failed. It failed in the first instance by training up Army Medical Officers in a system which every one acknowledged could not be carried on in the field, and would certainly lead to disaster; and in the second, because preventing the union of the Hospitals at one centre in each station, where with every modern appliance, and modern books and instruments, the best treatment might be available, and the Medical Officers might meet for mutual instruction and learn of one another, it kept the sick and the Medical Officers scattered in petty Hospitals, where it was impossible that extensive libraries or instruments could be collected or intellectual friction between the Medical Officers take place. We shall tabulate the objections in order.

(23) (*A*) *Failure in War-time.*—In the first place the Regi-

mental Hospital system failed in war. This is allowed by Lord Herbert's Commission in 1858, in a letter dated 9th July, 1858, "it is incapable of adapting itself to the Hospital requirements of an Army in the field," by every Military handbook on field service, and even by a distinguished advocate of the system in a pamphlet lately published. Why did it do so? Because it separates the medical department in the field into numerous small divisions each attached to every separate regiment, battalion, battery, or detachment, and places each of them under the command and disposal of their immediate military commander only, men who from their subordinate position are unable to take a view of any *Army* wants beyond their own immediate corps. Hence, if one regiment was very sickly or had suffered much in an action and other regiments in the same brigade were wholly unhurt, there was no authority able to co-ordinate the Medical Aid, and send all available resources to the place most needed. In the same division of eight regiments of the army two regimental hospitals might be full of wounded and even overflowing, while six other corps not engaged or under fire had few if any men in Hospital. The equipment and officers of the six corps lay idle while men were lying neglected in the other two. It was not competent for any authority to direct assistance to be given, and even if medical officers were detached to help, the equipment and appliances without which they were useless were still untransferable.

(24) The Inspecting Medical Officers had no authority to move or change any regimental officers, and it was only by official application to the chief commander of the army, necessitating long delays, that authority could be obtained to transfer even a single officer, and even then his commanding officer might throw obstacles in the way, and even this did not include the equipment. It tied up the hands of the medical department in every way, by wasting the services of three-fourths of the doctors in empty regimental hospitals, while many other medical officers were overcome by exhausting labours.

With such a system we marched to the heights before Sebastopol, and there, despite the heroic labours and self-sacrifice of the medical officers, the army melted away, until between deaths there and at Scutari 20,000 men had died of preventable disease.

The medical department, trusting to regimental organization and worked by officers trained up in that vicious and enervating system, was, despite every wish and desire to do so, wholly unable to cope with disease.

The system failed then for one reason amongst others, that was the powerlessness of the medical department under the regimental system to direct every energy on the point most needing assistance, and not to allow one set of hospitals to be empty while others overflowed.

(25) (*B*) *A Fallacious Unit for Organization.*—The unit of the regiment is uncertain now a days. It may be 400, or it may when going into the field and when the reserves and linked battalion men are with the colours, amount to 1,200. There is no certain data to work upon as regards the number of medical officers, the amount of equipment and supplies, or of transport and carriage needed. As we showed before, in the old days the regiment was a definite unit, and one to be trusted to base an estimate upon.

Even if suitably estimated for, the first action or the first field service or epidemic will throw out all the arrangements, because during a campaign, although the sick and wounded will always be an average when estimated by army corps, or groups of divisions, they will never be so when estimated by regiments or batteries; because position in the field, exposure to heavier fire, or having to bear the brunt of an attack, or unhealthy camp sites, will always swell up one regiment to an irregular degree, while others are wholly untouched.

(26) (*C*) *Change of System between Peace and War Hospitals.*—Even granting that during peace regimental hospitals were to have remained, and general hospitals under the control of the Divisional Principal Medical Officers were to be the rule in war, nothing but disaster could occur because you train men up under the enervating regimental hospital system, with the regimental commanding officer supreme, and carrying out all duties during peace; and in war when that officer would be far away, the Medical Officer accustomed to nothing but prescribing for the sick, would be left wholly helpless although responsible. Such could not be allowed. Men must be trained in peace for war. There can be no two systems. If regimental, the regimental commanding officer must be supreme and direct everything, and if not regimental, the Principal Medical Officer must direct. There can be no medium course, as it would lead to intense and constant friction. The regimental system trained up medical officers to look upon all duties, except prescribing for the sick, as foreign to themselves; a fallacy which every campaign has disproved, and in consequence of regimental training through many years men grew unable to administrate. We have been for years choosing our administrators

from officers nursed in Regimental institutions, in which they never felt their legs under them, were wholly unaccustomed to take wide army views of medical needs, and never learned to deal with officers of the department nor to carry out discipline amongst their subordinates. Such men so trained in regimental schools laboured under great difficulties in trying, when old, to learn to use the new powers entrusted to them. The practice of administration should commence from the first day the young medical officer joins the army, to accustom him to arrange for contingencies certain to arise in war time. Such is the system in the military department of the army; the young officer learning to deal with his squad, or half company, and eventually commanding the regiment, the brigade, or the division. There are no two separate systems, one for peace and one for war, and men learn to administrate from the first.

(27) (*D*) *Centralized Power in Regiment or Battery Commanding Officer.*—The theory now a days obtaining in the conduct of every system of affairs in the world is not to overburden one man with a host of various and dissimilar duties in some of which he is certain to fail, but to divide the responsibility amongst specially trained officers in each department. This was all reversed in the old regimental hospital system. A battery commander besides fighting his guns, and looking after his horses, and the interior economy of his Battery, had likewise to arrange about his hospital, its supplies, discipline, and regularity, and the Medical Officers, who by proper training could have done all much more efficiently, were in the meantime idle. By removing such foreign duties from the hands of the military officers and organizing under entire medical management efficient brigade and divisional hospitals, the medical staff of the service will be thoroughly utilized and waste of time and trouble by military commanders, who might be more suitably employed, obviated.

It seems absurd to think that to obtain a new pane of glass in a hospital window applications had to be forwarded through the commanding officer of the regiment, and to check the neglect of an attendant a tedious inquiry in the orderly room before the commanding officer was necessary. That everyday regimental subalterns, boys fresh from school, should come as representatives of the commanding officer to inspect and report if the Hospital was "clean and regular," although there were two or three medical officers, men grown grey in the service and full of experience, to look after it if needed. That the hospital serjeant or any of the orderlies were lent as a favour by the commanding officer and might

by his wish be any moment returned to duty in the ranks. Yet, it is true, and what is more, as long as the regimental system existed, the commanding officer was strictly correct in everything he interfered in; he was responsible and not the Medical Officers, and to him therefore was entrusted the power.

(28) (*E*) *Indifferent Peace Hospitals.*—Under the regimental system it was necessary in every garrison to have a separate hospital for the use of each individual regiment or battery even if the regiments in the garrison were eight, ten or more in number. We had thus in every garrison a great number of petty, roughly furnished, deficiently equipped hospitals, poor in style, and without those modern improvements and fixtures which are found to-day in every civil hospital, and which in the end mean comfort and efficiency. Now a days hospitals are expensive things, and no nation could afford to build a first-class hospital for every battalion and battery in a garrison. To do so would be ruinous. No doubt the true principle is to build one perfect Central Hospital in each garrison, replete with every improvement, and there bring to the treatment of the sick the best appliances of the day. In the field things must be rough; there is no reason they should be so in garrison; there at least the soldier should have all the advantages given to his civilian brother. Such hospitals could not exist under regimental organization, as there would be no central authority, and each regimental commanding officer would be striving to have his views carried out until chaos would result.

(29) (*F*) *Absence of Libraries, Chemical Laboratories and Expensive Instruments.*—To-day to carry out one's professional studies thoroughly, books are necessary, scientific magazines and professional periodicals are necessary, chemical laboratories well equipped are necessary, microscopes and expensive instruments are necessary. While divided into petty regimental groups of medical officers, serving by ones and twos in distinct and separate little second-rate hospitals, it was impossible for these necessaries to be collected together, or if collected they would be a tremendous expense to the State, and they could not be carried from place to place with marching battalions and batteries. They consequently did not exist and the medical officers were deprived of these all-important aids to increase their efficiency. By the absence of these essentials, the health of the army suffered more or less, because it operated against the further improvement of the medical officers in professional studies. Such necessaries can only be collected at great central hospitals, where all can have access to them and thus

improve themselves. It is quite certain that in a few years after the unification system is at work, particularly in the larger garrisons, we will find libraries and museums formed in each central hospital, together with clubs for the purchase of medical periodicals and professional papers of various sorts.

(30) (*G*) *Prevented all Station Tradition of Diseases.*—As under the regimental system all the medical officers marched into the station with the regiment, and marched out with it when it left the station, all the medical history of the station had to be learned afresh by each successive wave of regimental medical officers. This was a great drawback, especially in tropical and unhealthy climates, where men learned in the bitter school of experience what might have been handed down from one medical officer to the other under the garrison hospital system. It further necessitated regimental returns of sickness instead of garrison returns, and no continuous station statistics could be prepared, which are so useful, particularly in tropical climates.

(31) (*H*) *Impossibility of obtaining Skilled Nurses and Attendants.*—Under the regimental system it was impossible to obtain skilled nurses and attendants. The only post for a non-commissioned officer in a regimental hospital was that of hospital serjeant, and even he retained his post at the will of the commanding officer. If he became intelligent and smart he might at any moment be taken away for regimental military promotion and a man perfectly strange to the duty sent in his stead. As regards the orderlies they were generally either old soldiers, or awkward in the ranks, and who were hidden out of sight in the hospital. If a man turned out intelligent and trustworthy, he could not be promoted to even a lance-corporalship without resigning his position in the hospital, so that it was impossible to retain a good, active, ambitious man, and often impossible to get rid of a bad, idle fellow. Now nursing needs training, and the practice of trusting to ignorant but kindly men from the ranks could never last without a crash. If sickness became great the orderlies were too few, and there was no reserve to fall back upon; if a great crowd were always employed, they were idle and caused expense. The true way to avoid such difficulties is by having an efficient trained corps of soldier nurses such as the Army Hospital Corps employed in garrison hospitals, and receiving regular promotion in that corps when efficient and active.

(32) (*I*) *Prevented Uniform System of having all the Sick in Hospital.*—Although strictly contrary to army rule, many com-

manding officers permitted men not actually sick but delicate and weakly to remain in barracks "attending hospital," or on convalescent duty. Other commanding officers forbade this system. No definite rule was followed, and the returns of sickness were quite vitiated in their accuracy by not having a uniform system. Now under the garrison hospital system a man must be either in hospital or at duty and the apparent rise in the sick rate under the new system is caused by its putting an end to all irregular customs in this respect. In my own regiment we had five or six ways of allowing men to attend hospital and not do duty, all of which were contrary to army rule, but were winked at regimentally. No such half in and half out system should be allowed. It ruins discipline to have men half in hospital and half out of it, and when the day of duty comes round the men supposed to be fit for it, are found wholly the reverse. The "Daily State of Sick" should show every man not at duty for medical reasons. Many corps keep down their apparent number of sick by this most objectionable and false practice of allowing men to attend daily at the hospital and do no duty.

(33) (*J*) *Ruined true Esprit de Corps amongst the Medical Officers.*—The medical officers of the army under the regimental system instead of being united in one body for mutual instruction, mutual comradeship, and professional improvement, were torn into a hundred varying petty sections by being divided amongst a hundred regiments, each with separate systems and separate regimental customs. If the regimental system gave a home to a certain number of medical officers who were commissioned in the regiments, it threw several hundred officers perfectly on the world. The condition of the medical staff officers was most objectionable under that system. They did not belong to any regiment. They were knocked about from post to pillar. Their *moral* was injured by having no definite circle to look to for social amenities. They were too few to have a mess of their own, because the majority of the department was in regiments, and had to attend the regimental messes, whereas if all had been simply departmental officers, they might have had pleasant Medical Staff Messes, where the young officer would have a home and would learn the tradition of the service and of his department. It is impossible to overrate the positive injury the young medical staff officers suffered by the old system. Literally no man cared for them. It was impossible for their regimentally commissioned brother officers to take them to the regimental messes constantly, and even if they did they were strangers and outsiders there. Serving only a few weeks in a

Regiment no one cared to take an interest in them, and if the abolition of the old system did no more than this, its abolition was a universal boon. Doubtless the true condition should have been to have had in every large garrison a properly organized Medical Staff Mess where all the medical officers might have found a home, and where the senior officers might have been able to guide and to form the young men. Such institutions will now spring up, and nothing but good will come of them. We have a splendid tradition in the medical department of devotion to duty, of self-sacrifice, of courage, and of every manly quality, but alas! up to the present it has been an individual instead of a departmental tradition.

(34) *The Dress of the Medical Officers* under the old system varied in every corps. Men who were not artillerymen wore artillery dress, who were not Highlanders wore the kilt, who were not hussars wore hussar dress. Weak-minded men now and then forgot that although dressed in these varying uniforms, they were neither hussars nor Highlanders nor gunners, but simply Army Medical Officers, nothing more but assuredly nothing less. It was impossible under regimental organization to have one army uniform for the medical officers, which every soldier might know, which would not be a travesty of the uniform of any corps, but handsome as the best of them, the same no matter where serving, and an outward and visible sign of their department. To distinguish the medical officers of regiments under the old system was the work of an expert, and provoking and petty withdrawals of ornaments or special articles of dress had to be made to distinguish the medical officer from the combatant. Under the army system this will disappear. One uniform, distinct and definite, the badge of a department which should and will stand as high as the best corps in the service will be the rule, and let us hope it will be the sign of union and great departmental *esprit de corps*.

(35) (*K*) *Irregular Tours of Foreign Service.*—No officer suffered more than the medical officer under the old regimental system for want of a definite roster of foreign service. One regiment would remain abroad twelve years, while another never left Great Britain. By exchanging and keeping one's eyes open foreign service might be completely avoided or the least quantity gotten through by some lucky individuals, while others were always abroad. Take Ceylon for example as a station for medical officers. Regimental medical officers remained there ten years at a spell in the old days, the staff doctors remained there only three years. In India a regiment remained for service twelve years and often more, while staff

doctors came home every five years. It was wholly impossible to have any method or system in the roster, because men had to follow their regiments and stand by them at all hazards. The military department got the chance of coming home to the depôts every three or four years, and thus although the regiments nominally remained abroad twelve years, no officers except the medical officers were without a turn of home service. Now we can have a fair and uniform system inaugurated and every one will benefit by it.

(36) (*L*) *Impossibility of suiting the Medical Staff to the Varying Requirements of Garrisons.*—If there were three medical officers in a battalion they had to remain with it in every station it went to, whether a healthy or a sickly one. One corps serving in Rawal Pindi in an excellent climate had the same staff as another cantoned at Morar or Mian Mir. The system had to be maintained and there was no power of increasing or decreasing the staff to meet the varying wants of each station. This was a false principle. Even in the same garrison if one regiment was more sickly than the others, there was no power of equalizing the labours of the medical officers. One body might be quite idle and the other quite overworked. By having the garrison hospital this will be prevented, and further, leave of absence, impossible often under the divided system, will under the new system be more easily obtained.

(37) Again, it is to be noted as important that when Medical Officers were regimentally commissioned, and the Hospitals worked regimentally, the most senior medical officer of the staff or of another corps was junior to the youngest regimental Medical Officer in his Regimental Hospital; he took responsible charge over their heads; was alone consulted in all medical questions, and directed the action of those who were his seniors in the army but his juniors in the regiment. Friction, disagreements, and divisions were fostered by such a system to the detriment of the service and the department. Now by having one medical corps every officer will have his seniority respected and his proper place preserved.

(38) It is quite true, although a sad thing to state, that it has been necessary to forbid officially the system that obtained in some regiments of assigning the least important and least inviting duties to the staff doctors temporarily attached to the regiment whatever their seniority was. It seems that a few senior medical officers were weak enough to believe that unless a man was commissioned in their own regiment he could not have been of much account. Such perverted *esprit de corps* would be laughable if not rather painful.

(39) (*M*) *Depressed the Position of the Army Medical Officer as a unit in the Army.*—Much sentiment has been expended on the "happy home" theory of the regimental system. Let us calmly look into the question. Old army days are dead, and when Surgeons-General who served in regiments before that great epoch called the Crimean war talk of their early days, they are quite "in the air" if they think the same feeling exists to-day as in those apparently very good old times. The younger men in great proportion do not share those feelings. They believe it truer in principle to exist alone as an important Army corps standing on its own basis, knowing its own position, doing its own work, and wearing its own uniform, than to cling for support, for prestige, and for position to any corps, be that corps what it may.

The day for submitting quietly to a hundred petty but harassing frictions, such as must occur between the military and medical departments when working in the same corps, has now passed by. Why should we go on working a false and failing system that was certain to break down in the field, and which in addition depressed us as a body into nothingness, when a better system can be adopted and all these frictions set at rest for ever?

Turn back the pages of the *Lancet* and other medical journals, or the files of the military papers, and read the complaints in the much vaunted regimental days. Were there none? Aye, hundreds. In the good regiments—for there are good regiments—a man's position was singularly happy, but in the regiments less good it was often the reverse. It depended too much on the varying views of a Commanding Officer what *official* position the regimental medical staff occupied. All this is to-day ended. We can stand by ourselves, if we determine to do so. We shall be better doctors, better administrators, and stand forward as a department in the Army which cannot be overlooked, if we only stand true to one another. Our division has been our weakness. Unification in the medical department of the Army means increased professional and military efficiency, which is our highest aim, and a more definite and far more independent social existence.

(*To be continued.*)

Reviews.

THE CLINICAL PATHOLOGY OF SYPHILIS. By Hugh Wansey Bayly. London: Baillière, Tindall and Cox. Crown 8vo. Pp. xiv and 194, with three plates and 22 figures. Price 5s. net.

The author has written this book for the benefit of students and practitioners, to acquaint them with the practical bearing of recent work on the pathology and treatment of syphilis. In a volume which is no larger than a "Wellcome's Medical Diary" he has managed to condense practical details on the best methods of demonstrating the *Spirochæta pallida*, on the Wassermann test of serum and cerebro-spinal fluid, the cytological examination of the cerebro-spinal fluid, the anæmia of syphilis and the "luetin" reaction; he discusses the bearing of each of these on the diagnosis and treatment of syphilis and describes the treatment of syphilis with salvarsan and neo-salvarsan. Knowing the enormous amount of literature on these subjects, one would expect that such condensation would lead to inaccuracy and the giving of false impressions. This is not the case, however, if we except one or two errors in the calculations connected with the Wassermann reaction on pages 71-73, which do not materially affect the principles enunciated. The author has the gift of saying much in a few words, and his large experience of syphilis, from a clinical as well as a pathological point of view, has enabled him to steer clear of those subjects which at present interest only the pure pathologist.

We commend this eminently practical and readable book to anyone who wishes rapidly to acquire a knowledge of the recent important work on the diagnosis and treatment of syphilis. L. W. H.

A SYSTEM OF SURGERY. Edited by C. C. Choyce, M.D., F.R.C.S. Cassell and Co., 1912. Issued in three volumes. Pp. xxii. and 957. Price 21s.

The first of these volumes is now published, and the author states in a short preface that "The work is designed for the practitioner of surgery who desires to keep himself abreast of the most modern teaching, and for the senior student who aims at a sound and comprehensive knowledge of present-day surgery."

It has been written by surgeons and pathologists who are actively engaged in teaching and in practice. The net has been widely cast. The aim was to produce a work representative of the surgery, theoretical and practical, of Great Britain, and it is hoped that the list of authors shows that the endeavour has not been unsuccessful.

Volume I. is devoted chiefly to the consideration of Surgical Pathology and General Surgery. It begins with a chapter on "Surgical Bacteriology," by Dreyer and Ainlie Walker, which is followed by a note on Applied Bacteriology from the pen of J. H. Eyre.

The next chapter, on the subject of "Inflammation," written by J. Martin Beatty, is superbly illustrated both by coloured plates and reproductions of micro-photography. This is succeeded by articles on the clinical course and treatment of Inflammation, on Repair, with reference to special tissues, on Suppuration, and on Gangrene.

The chapter on "Wounds and Wound Treatment," by C. C. Choyce, is a masterpiece of clear description. As success in wound treatment is to be found in cleanliness and simplicity, the use of a complicated technique is discouraged as tending to vitiate that end.

Military Surgery, by Major Spencer, is an account chiefly of gunshot wounds. It includes several plates showing the effects of projectiles on bone, and is in every way on a level with the high standard we expect from such an expert.

The section on Tumours, by Raymond Johnson and T. W. Lawrence, gives a clear and thorough description of the growths, benign and malignant, which come so frequently to the notice of a surgeon.

An account of X-ray Examination is written by W. Ironside Bruce and copiously illustrated.

General Anæsthesia is treated by J. Blumfield, and Local Anæsthesia by Gwynne Williams.

There is an excellent article on Spinal Analgesia by Laurie McGavin.

The article on Acquired Syphilis has been written by the late Colonel Lambkin, whose work on this subject is so well known, and the use of salvarsan in the treatment of this disease is described by Majors Gibbard and Harrison.

The subject of Venereal Diseases other than Syphilis is dealt with by Ludham-Green, and the volume concludes with descriptions of Yaws, Glanders, Tetanus and Surgical Diseases caused by animal parasites.

We cannot speak too highly of this volume, which is well bound and richly illustrated, and congratulate the editor on the achievement of his aim and the production of a work worthily representative of the surgery of this country. J. W. H. H.

Rose and Carless's Manual of Surgery. Eighth Edition. Revised by Albert Carless, F.R.C.S. Baillière, Tindall and Cox, 1911. Pp. xii. and 1,406. Price 21s. net.

That this well-known Manual should reach another edition is merely a realization of the expected. It has been the students' "bible" for the past ten years, not only in this country, but in America and China; while the name "Rose and Carless" is now as intimately associated with surgical education as the "Treves" or "Ericksen" of a former generation.

In this new edition several chapters have been rewritten and new theories and advances in science, such as Wright's opsonic index and Wassermann's reaction, have received fuller notice.

There are also many fresh and instructive illustrations.

As "a good wine needs no bush," so of this Manual we can but say that it is as good as ever. J. W. H. H.

An Operating Theatre in Private Practice. By C. Hamilton Whiteford, M.R.C.S., L.R.C.P. Messrs. Harrison and Sons, 45, Pall Mall, London, S.W., 1912. Pp. 69. Price 3s. 6d. net.

The careful study of this little book will amply repay all who contemplate the building and equipping of an operating theatre, and also all operating surgeons and nurses.

Although small, the book gives the chief points in operating-room construction and equipment, going, where necessary, into detail. Heating,

ventilation, lighting (by day and night), the anæsthetic, dressing and sterilizing rooms, sterilizers, and the theatre itself are all succinctly and clearly described in the light of the requirements of present-day surgery.

An appendix gives a useful synopsis of the elementary facts of asepsis for nurses. The author has aimed at the description of a building in which strict asepsis can be observed with a minimum of labour for all concerned—appearance being made subservient to utility and ease of work—and he has, in our opinion, been completely successful.

C. B. L.

LANDMARKS AND SURFACE MARKING OF THE HUMAN BODY. By L. Bathe Rawling, M.B., B.C.Camb., F.R.C.S.Eng. H. K. Lewis. Pp. viii. and 96.

Mr. Bathe Rawling's book has enjoyed a popularity which has necessitated the issue of five editions in some seven years. The fact speaks for itself and argues the fullest appreciation by both teachers and students. As a selection of the anatomical facts most useful in clinical medicine and surgery, admirably chosen, concise, and easily remembered, and illustrated by boldly marked plates, it probably contains as much information as any work of its size. The fifth and latest edition has not received any addition to the text, but the arteries and veins are marked in colours and the pleura in plates xvi and xvii is tinted yellow, while in plate vii some information is added regarding the surface anatomy of the spinal cord and of the theca spinalis, matter of obvious interest in connexion with spinal anæsthesia. The new edition fully maintains the high standard of its predecessors. E. M. P.

A SURGICAL TREATMENT OF LOCOMOTOR ATAXIA. By L. N. Denslow, M.D., Fellow New York Academy of Medicine. Baillière, Tindall and Cox, 1912. Pp. x. and 118. Price 3s. 6d. net.

This little book is an attempt to popularize fresh methods for the treatment of locomotor ataxia.

This attempt would be more than justified if the author had proved his first premise. He opens with the statement that in every case of this disease an abnormal condition of the urethra exists and that by treatment directed to this condition many of the symptoms of the disease may be cured or alleviated.

A number of cases are then quoted showing the benefit occurring to the patients after the passage of urethral sounds. Some of these patients were the subjects of locomotor ataxia and others undoubtedly were not. Amongst the latter is a case of alopecia, which was cured in six weeks by passing sounds into his urethra. This is interesting and might be a useful hint to dermatologists, but the information is scarcely relevant to the treatment of locomotor ataxia.

The undoubted cases of this disease which are here quoted as being improved by urethal dilatation are too few in number to permit any generalizations of importance, while the special pleading for this line of treatment in unconvincing. J. W. H. H.

IMPROVISED METHODS OF AID IN THE FIELD, &c. By H. Mackay, M.D., Colonel R.A.M.C. (T.F.), A.D.M.S. Wessex Division. Second Edition. 1912. Eyre and Spottiswoode. Pp. viii. and 156. Price 1s. 6d. net.

The first edition of this work has already been reviewed in the Journal. This edition contains some useful new matter and illustrations, which

are most essential in a work on construction. The book deals chiefly with mechanical appliances—stretchers, vehicles, springs, utensils, tents, shelters—for reasons given in the preface.

One would be glad to see some more work done on improvised dressings, on the lines of the Japanese straw-ash pads, and some directions on other materials to be chosen for the making of improvised dressings.

The Manual is well done, and should be most useful to those for whom it was written; and the writer shows a practical knowledge of details which enables him to give the information required by those who would put his designs into execution. H. E. R. J.

PUBLIC HEALTH CHEMISTRY AND BACTERIOLOGY. A Handbook for D.P.H. Students by David McKail, M.D.Glas., D.P.H.Camb., F.F.P.S.G. Bristol: John Wright and Sons, Limited, 1912. Pp. iv and 409. Price 6s. 6d. net.

The subject matter in this small book is said to be confined to the practical laboratory work required for D.P.H. examinations, and is divided into two parts. The first part deals with Public Health Chemistry and the second part with Public Health Bacteriology.

The first part gives a clear description of the usual processes for the analysis of water, air, soil, foods, beverages, and disinfectants. The various little details of the processes are described concisely, and the examples given illustrate well the subject in hand. One would have liked to see more space given to the difficult question of the interpretation of the results of water analysis. Little more than a page has been devoted to this.

The second part of the book is not so good as the first part. Too much has been attempted in the space available, and a long description of immunity and anaphylaxis is out of place in a work of this kind. The accounts of the micro-organisms described are somewhat out of date and the various bacilli are not well classified. The method which is recommended for the bacteriological examination of water is out of date and some of the statements are likely to lead the student astray, such as "if a plate shows only one kind of colony, inoculate an agar slope from a mixture of these." In the description of the characteristics of *Bacillus typhosus* it is stated that in litmus milk it forms slight acid at first, later a deep blue from formation of alkali. Though a few strains of the bacillus have been found to produce such alkalinity it can hardly be called a characteristic reaction.

On the whole, however, the book, especially the first part, will be found a useful guide to D.P.H. laboratory work.

H. B. F.

RIEDEL'S MENTOR, 1912.

This annual is a very useful work of reference, in which are embodied abstracts of the literature of pharmacological preparations which have been introduced recently. Possibly of most interest is the notice of the eosine-selenium compound which has a specific action on malignant tumours of mice. Mastisol, a varnish for the immediate application to wounds, would seem to have a place in military surgery. Attention was drawn to it in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, vol. xviii, p. 119. v. Oettingen's original preparation consisted of

20 grm. of gum mastich, 50 grm. of chloroform, and 20 drops of linseed oil. Benzine has been substituted for the chloroform, and some not-named ester for the linseed oil in the proprietary article which is sold under the above name.

Mesotherium, a radio-active substance, is described. Reports on its action are filling many pages of the German periodical medical press at the present time.

There is a good epitome of salvarsan literature, but neo-salvarsan is not mentioned.

These examples show that information may be obtained from this volume which otherwise must be gained by long and arduous search in foreign medical journals. C. B.

MANY CAMPS. By Captain A. W. Howlett, I.M.S. Pioneer Press, Allahabad. Pp. 204, 8vo.

This little book contains twenty-six sketches of Indian life, which have previously been published in the *Manchester Guardian.* In his introduction the author refers to the colossal ignorance of India usually displayed by the cold weather tourist, and hopes that his sketches may help intending visitors to India to gain some slight insight into Indian customs and thought. Captain Howlett is evidently in sympathy with his subject and has the happy knack of making his descriptions most interesting. We hope that young officers proceeding to India for the first time will read the book, not only for the pleasure which it is sure to afford them, but also that their minds may be attuned to the new surroundings in which the next few years of their life must be passed.

C. E. P.

Current Literature.

Salvarsan.—Ehrlich (*Zeitschrift f. Chemotherapie,* I. Original, June, 1912) sums up the evidence on salvarsan. Impure water is the most frequent cause of febrile reactions after intravenous injections. Distilled water supplied by chemists may contain 1,500 million bacteria per cubic centimetre. When they are destroyed by heat they are still pyrogenic. Occasionally a milder febrile reaction occurs, which comes on some hours later than that due to bacteria in the water. This is attributed to the toxins liberated from the treponemata which have been killed by the salvarsan. Salvarsan exercises no injurious effect on the endothelium of the blood vessels. Fehde administered it in a 6 per cent solution without bad consequences. When thrombosis has occurred it has been produced by injecting an acid solution, or one containing an excess of alkali. Fourteen nerve disorders were noted in 4,400 cases. Since attention has been directed to ensuring the purity of the water the ratio has decreased. Oltramare has reviewed critically the reports of deaths after salvarsan which have been recorded. He thinks that only a dozen out of the 150 can be imputed to the remedy. The rest are to

be ascribed to overdosing, impure water, or decomposition of the salvarsan solution. When death is due to salvarsan the result is in most instances caused by cerebral complications, such as meningeal irritation, multiple hæmorrhages in the brain, or acute œdema. Sometimes these symptoms come on immediately after the first dose. Ehrlich is of opinion that failure in technique is responsible for these accidents. In a more important group of cases, however, the first injection is well borne, it is the second or a later dose which has the fatal effect. On post-mortem examination, chronic nephritis, hepatitis, lymphosarcoma, Addison's disease, and affections of the heart have been found. Patients who suffer from coarse cerebral lesions are intolerant of salvarsan. Failing to reduce the dose has ended in disaster. Long railway journeys, violent exercise, excesses of all kinds account for some of the casualties. Ehrlich states that there have been exceptional cases recorded in which death was preceded by an extensive skin eruption and changes in the liver. These are to be attributed to decomposition of the salvarsan. They have occurred mostly after intramuscular injections, not only in syphilitic, but also in sleeping sickness and relapsing fever patients. Arsenophenylglycin has produced similar effects. It is vitally important that there shall be no delay between the time of the preparation of the solution of salvarsan and its administration. Recent researches show that the treponemata invade the meninges in the early secondary stage. Headache, sleeplessness, lumbar and rheumatic pains, asthenia, giddiness, faintness, nausea, mental symptoms, anomalies of the cranial nerves, disturbances of speech, epileptoid conditions, cramps, pareses, palpitation, are indications that the first dose of salvarsan should never reach 0·6 grm., but should be reduced to 0·3 grm. In suspicious cases 0·1 to 0·15 grm. only must be given. Experienced observers recommend that a preliminary course of mercurial injections should precede the salvarsan treatment in these cases. The intervals between the salvarsan injections should be lengthened. If untoward symptoms of intracranial pressure arise, lumbar puncture must be performed immediately. Ehrlich has received reports of four cases where this treatment was efficient. Should this fail, then a decompression trephining operation must be undertaken without any delay. Ehrlich says that salvarsan may be pressed fearlessly in the abortive treatment of primary sores of less than a fortnight's duration, for at this early period the treponemata will not have penetrated the cranial cavity. Two or three grammes of salvarsan in divided doses, combined with mercurial injections, will abort the infection in a large proportion of cases. The longer the disease has existed the less certainty there is of a cure. Nevertheless, Leredde and Milian have reported permanent improvement in so intractable sequelæ as tabes dorsalis. Ehrlich concludes by quoting Wechselmann, who says that he has given more than 12,000 injections without a death. Several thousands of these, made under an improved technique, resulted in no reaction at all. The patients have not complained of the least discomfort.

C. B.

Ideal Methods of Quininization.—D. Thomson (*Annals of Tropical Medicine and Parasitology*, Vol. VI., No. 2, July 31, 1912), in discussing the prophylaxis of malaria in a population by the administration of

quinine, states: "In British colonies where malaria is rampant, the ideal aim of experts is to get every person to take 5 gr. of quinine daily, whether ill or not. Those who are ill with malaria, of course, would take more than this amount daily, till better, and then proceed as before. In carrying out this ideal, therefore, each adult would take 1,825 gr. of quinine per annum, if well during the year, and more, say, 2,000 gr. per annum, if ill at some period of that year. Though this method is undoubtedly excellent, yet I think that the following method would be much more scientific and efficacious, and shall call it Ideal Method A: That every adult person in the population (children in proportion according to age) should take 20 gr. of quinine daily and simultaneously for a period of three weeks, quarterly, i.e., four times a year. This amounts to 1,680 gr. per adult per annum, if well during the year, and probably 1,800 gr., if ill at some period of the year. This, in the aggregate, is less quinine than in the former method."

He further says that 5 gr. of quinine daily is insufficient to prevent infection from mosquitoes, and would require a very long time to eradicate malaria from the system. This amount of quinine by making the blood less suitable for the parasites, tends to keep the disease latent without curing it. The larger dose recommended above would almost certainly destroy both asexual and sexual parasites. After this period the person will be non-infective to mosquitoes, and in the great majority of cases will be cured of the disease. Infective mosquitoes must also become fewer in number. A more scientific method would be to take a quarterly census of the blood of the population. Only those harbouring parasites would take the three weeks' course and those with crescents in their blood would, if possible, be isolated in mosquito-proof hospitals till non-infective.

C. E. P.

Indian Field Service Ration.—The Government of India have recently sanctioned a new scale of rations for both European and Indian troops on field service. The new scale is as given below. The essential idea of the new scale is to ensure a greater elasticity in respect of individual items, by laying down alternative issues in the case where articles from stress of conditions or supply are short issued.

BRITISH TROOPS.

Field Ration.

(1) Bread	1 lb.
(2) Fresh meat	1 lb.
(3) Bacon	3 oz.
(4) Potatoes	1 lb.
(5) Tea	1 oz.
(6) Sugar	$2\frac{1}{2}$ oz.
(7) Salt	$\frac{1}{2}$ oz.
(8) Pepper	$\frac{1}{36}$ oz.
(9) Fuel	3 lb.

Extras.

(1)	Chocolate	1 oz.
	and	
	Bread	4 oz.
(2)	Lime juice	$\frac{1}{2}$ fl. oz.
	and	
	Sugar	$\frac{1}{2}$ oz.
(3)	Rum (25 % U.P.)	4 fl. oz.

Ordinary Substitutes.

Articles short issued.	*Articles substituted.*
(1) 1 lb. bread..	$\frac{3}{4}$ lb. biscuits or 1 lb flour (or atta) with 1 lb. fuel, $\frac{1}{4}$ oz. of ghi and $\frac{1}{4}$ oz. of baking powder.
(2) 1 lb. fresh meat	$\frac{3}{4}$ lb. preserved meat with $\frac{1}{3}$ fl. oz. of vinegar.
(3) 1 lb. bacon..	1 lb. cheese or $1\frac{1}{4}$ lb. fresh meat.
(4) 1 lb. potatoes	2 lb. fresh vegetables or 4 oz. dhall or 8 oz. rice or 4 oz. preserved potatoes or 4 oz. pickles — These substitutes will usually be issued in the proportion of 3 oz. of preserved potatoes to 1 oz. pickles.
(5) 16 fl. oz. rum (25 % U.P.)..	2 oz. tea and 4 oz. sugar.

Special Substitutes.

Articles short issued.	*Articles substituted.*
(1) 1 lb. bread	8 oz. oatmeal and 6 oz. condensed milk.
(2) 1 lb. potatoes	8 oz. preserved fruit or jam.

NOTE 1.—Extras and special substitutes will be issued on the authority of the officer commanding on the spot.

NOTE 2.—Ordinary substitutes will be issued without special authority, provided the stock on hand admits of this course.

INDIAN TROOPS AND FOLLOWERS.

Field Ration.

(1) Atta	$1\frac{1}{2}$ lb.
(2) Fresh meat	4 oz.
(3) Dhall	4 ,,
(4) Ghi	2 ,,
(5) Gur	1 ,,
(6) Potatoes	2 ,,
(7) Tea	$\frac{1}{3}$,,
(8) Ginger	$\frac{1}{3}$,,
(9) Chillies	$\frac{1}{6}$,,
(10) Turmeric	$\frac{1}{6}$,,
(11) Garlic	$\frac{1}{6}$,,
(12) Salt	$\frac{1}{2}$,,
(13) Fuel	$1\frac{1}{2}$ lb.

Extras.

(1) Atta	$\frac{1}{2}$ lb.
(2) Ghi	1 oz.
or	
Gur	2 ,,
(3) Rum (25 % U.P.)	2 fl. oz.
(4) Lime juice	,,
and	
Sugar (or gur)	$\frac{1}{2}$ oz.

Ordinary Substitutes.

Articles short issued.	*Articles substituted.*
(1) 1 lb. atta..	1 lb. rice.
(2) 1 lb. meat	3 oz. gur.
(3) 1 lb. potatoes	2 lb. fresh vegetables or 1 lb. preserved fruit.
(4) 1 lb. of chillies, turmeric or garlic ..	1 lb. of garlic, turmeric or chillies.
(5) 16 fl. oz. of rum (25 % U.P.)	2 oz. of tea with 4 oz. of sugar (or gur).

NOTE 1.—Extras will be issued on the authority of the officer commanding on the spot.

NOTE 2.—Ordinary substitutes will be issued without special authority, provided the stock on hand admits of this course.

Modern Methods of Quarantine against Asiatic Cholera.—Assistant-Surgeon A. J. McLaughlin, Public Health and Marine Hospital Service (*Military Surgeon*, August, 1912), read a paper on this subject at the Twentieth Annual Meeting of the Association of Military Surgeons. The object of the paper was to draw attention to the existence of cholera carriers and to show how these might fail to be detected by the ordinary quarantine regulations. He quoted his experience in the Bilibid Prison in Manilla, in which institution cases of cholera occurred in spite of stringent sanitary precautions. On making a bacteriological examination of the stools of all persons employed in connexion with food or water supplies, seventeen cholera carriers were detected among 264 persons examined. The outbreak ceased when an order was enforced compelling thorough disinfection of the hands upon leaving the latrines and before eating. This order has been kept in force and, in addition, the stools of all new admissions are examined bacteriologically. There has been no further outbreak since.

McLaughlin states that he has never known a carrier to harbour cholera vibrios for more than twenty days, although other observers have recorded cases lasting as long as sixty-nine days. In view of the danger of cholera being introduced by carriers, the United States Government in 1911 proposed a bacteriological examination of the stools of all steerage passengers from infected ports.

The procedure adopted was to divide the emigrants into batches of 150 to 200. Each individual had a coloured tag, the colour being different for each group. No communication was allowed between different groups.

Each individual passed his stool into a paper receptacle and brought it under supervision of an orderly to the examining officer. After the specimen had been taken, the paper receptacle was dropped into an ordinary flour barrel, which, when full, was burned. The specimens were planted in peptone by means of a sterile piece of wood, which was afterwards burnt. Each man's name was recorded in a book and received a consecutive number which was also recorded on the peptone tube and on his coloured tag. The tube was incubated for six hours at 37° C. A smear was then made from the peptone and stained with carbol fuchsin. From twenty-five to fifty fields were examined in each slide. If no suspicious organism was found the examination was not proceeded with. When any curved organisms were found subcultures in peptone and on plates were made. As a rule only 10 per cent. of the tubes required to be subcultured. Suspected colonies were fished and tested with specific cholera serum.

Employing this method, ten bacteriologists were able to examine 1,000 specimens in a single day, and to complete the whole examination of 1,200 persons in forty-eight hours. This was claimed to afford much more efficient protection against the introduction of cholera than five days' quarantine.

C. E. P.

Balantidium Coli as a Cause of Dysentery in the Philippine Islands.—Lieutenant H. R. Weston, Medical Reserve Corps, U.S.A. (*The Military Surgeon*, June, 1912), published notes of two cases of dysentery which were due to this infusoria. Clinically the cases re-

sembled those of amœbic dysentery. Laboratory examination of the stools failed to find any amœbæ, but large numbers of *Balantidium coli* were present. These were cultivated on Musgrave's modified agar-agar. Treatment was mainly by ipecacuanha, which seemed to inhibit the growth of the infusoria, but in one case did not effect a complete cure, while in the other, six weeks' treatment were required before he could be discharged from hospital.

C. E. P.

Report of the Department of Sanitation of the Isthmian Canal Commission for the month of February, 1912.—Extract from the Report of the Board of Health Laboratory on Murrina, a trypanosomal disease of horses :—

. . . . . .

"One other mode of infection impossible to investigate directly in the corrals required looking into, namely, the possibility of infection during coition. The only way of testing this experimentally was by noting whether *Trypanosome hippicum* could pass through the intact mucous membranes of mules."

. . . . . .

"The experiments were carried out in a screened stable, practically free from flies.

"The mules had previously been used in an experiment in which one of three mules was infected with *T. hippicum* by means of *Musca domestica* that had fed on infected guinea-pig's blood. These two remaining mules had not been infected, and were kept under observation in a screened corral; daily examinations of the temperature and blood were made. During a period of thirty days, as they showed no rise of temperature, nor trypanosomes in their blood, and as auto-agglutinins were not developed, it was assumed that they had not been infected.

"About 10 c.c. of citrated saline solution containing about 0·5 c.c. of guinea-pig's blood richly infected with *T. hippicum*, was introduced into the vagina of mule No. 193, using an all-glass syringe having a smooth nozzle which could not abrade the vaginal mucosa. Most of the fluid was ejected upon the ground, but it did not come in contact with the skin or any abraded surface on the legs of the animal. On the tenth day the animal's temperature, which had been uniformly 101° F. in the morning and evening, rose to 102° F., but trypanosomes could not be detected, though there was some auto-agglutination of erythrocytes. This has been observed in other experimental mules to appear just before trypanosomes could be demonstrated in films. On the eleventh day the temperature was 102·6° F. in the morning, and trypanosomes were detected in the films for the first time. The following morning the animal's temperature was 103·6° F.

"In the other mule, trypanosomes were introduced into the mouth and nasal cavity. Ten cubic centimetres of citrated saline suspension containing 0·5 c.c. guinea pig's blood richly infected with *T. hippicum*, was divided into two portions. Five cubic centimetres were introduced into the mouth, and 5 c.c. into the nasal (right) cavity by means of a syringe, the muzzle of the mule being elevated so as to avoid waste of the infected fluid. The mucosa was not touched by the nozzle of the

syringe. On the ninth day the animal's temperature rose from 101° F. to 102·8° F., and trypanosomes were detected in blood films.

"These two experiments are of significance because they indicate very positively that *T. hippicum* can penetrate the mucosa of mules, which in the mouth and vagina is much thicker in proportion to the length of trypanosome than that of guinea-pigs and rats, used in other experiments, and it is assumed from this that murrina may be transmitted during copulation."

Austrian Army Medical Service in the Field.—Reg. Arzt Dr. Beykovsky (*Deutsch. Militärärzt. Zeit.*, July 20, 1912, p. 539) has given a short sketch of the recent changes in the Austrian Army Medical Organization for War.

With the exception of the mountain brigades each division now has attached to it a divisional medical unit (field ambulance). This unit is now organized in the following sections: (*a*) Echelon of aid-post wagons; (*b*) slightly wounded section; (*c*) dressing station; (*d*) ambulance wagon echelon. The ambulance and reserve material sections, as also the field medical column of the Teutonic order, have been abolished. The functions of the former "ambulance" are now performed by a portion of the dressing station section, the "Unterkunftsgruppe." The reserve material packed in two carts, as also the material carried by the detachment of the Teutonic order, now form part of the dressing station section. The four ambulance wagons of the Teutonic order have been assigned to the ambulance wagon echelon. To adapt the infantry divisional medical unit for mountain warfare, extra equipment has been allotted to it (*Ergänzungsgarnitur für den Gebirgskrieg*). By means of this additional equipment the infantry divisional medical unit can form four dressing station sections with pack transport.

The Infantry Brigade medical unit assigned to independent brigades is organized in the following sections: (*a*) Echelon of aid-post wagons; (*b*) dressing station; (*c*) echelon of ambulance wagons.

A mountain brigade medical unit now has only the two sections; viz., dressing station and wounded transport column. The wounded are to be brought to the dressing station by the wounded transport section in mountain carts and by hand transport on stretchers and "Kraxen"; assistance may be obtained from the local inhabitants.

Infantry divisions composed of mountain brigades will each have a divisional echelon of ambulance wagons and a transport column, which in addition to four-horsed ambulance wagons will also have a number of two-horsed "Tarantas" provided by the Hungarian Red Cross Society and a medical store wagon provided by the Teutonic Order.

The cavalry divisional medical unit has had an echelon of aid-post wagons added to it.

Each of the three sections of the field hospital has now been constituted an independent field hospital, with accommodation for 200 patients.

The field hospitals, with mountain equipment, are organized in two sections, which can act independently. One section is equipped for pack transport.

The three sections of the mobile reserve field hospitals (clearing hospitals) have been made into three independent units of 200 beds each.

The "Feldmarodenhäuser" have not been altered in any way. Hospital trains and ships have been re-classed as: (*a*) "Spitalzüge" and "Spitalschiffe" for the transport of serious cases requiring attendance; (*b*) "Krankenzüge" and "Krankenschiffe" for the conveyance of less serious cases not requiring skilled attendance. A "Spitalzug" can carry 144 lying-down patients, a "Spitalschiff" 116.

Three "Krankenzüge" (improvised ambulance trains) are allotted to each army corps in the field. By the time the strategic concentration is completed, one of these trains, accommodating 64 lying-down and 300 sitting-up patients should be mobilized.

The regulations governing the use of voluntary aid in the field have also been revised. The following units will in future be employed:—(1) Red Cross Society's field hospitals, which are equivalent to those of the army; (2) hospitals for wounded provided by the Teutonic Order (these are equivalent to clearing hospitals); (3) permanent ambulance trains equipped by the Sovereign Maltese Order; (4) hospital ships of the Red Cross Society. In the home territory: (5) reserve hospitals and (6) convalescent depôts provided by the Red Cross Society; also where offered, beds in civil hospitals and nursing homes; rest stations. In the field, for the replacement of medical supplies, the mobile medical stores depots of the Red Cross Society will be employed; in the home territory, the Society's reserve depots of medical stores will be made use of.

C. E. P.

Health of the French Army.—Méd. Principal Labit (*Archives de Méd. et Pharm. Militaires*, February and March, 1912) contributed a paper in which he gave an analysis of the health of the army, and discussed the causes which have had an unfavourable effect on it.

Labit has compiled tables for the years 1901 to 1908, showing the number of men admitted for treatment in any form, the number of deaths and the number of men discharged from the service. These show that the number of men requiring medical treatment has steadily increased during the period under review: it reached 755 per 1,000 in 1908. The ratio of deaths fell steadily till 1905, since when there has been a constant increase; in 1908 it was 4·05 per 1,000 of strength. The number of discharges has fluctuated in different years, but on the whole shows a marked increase, being 41·8 per 1,000 in 1908.

Most of this unfavourable effect on the health of the army is ascribed by Labit to the effect of the law of 1905, by which the period of service was reduced to two years. Prior to 1905, soldiers in their first year of service, who are more susceptible to disease than older soldiers, formed a third of the army, since then they form a little more than half. The law of 1905 also permitted the enlistment of men of poor physique in the non-combatant branches of the army. These men have contributed largely to the increased sick rate. The custom introduced during recent years of giving short leave of absence on Sundays and at Christmas and Easter time is mainly responsible for the increased incidence of infectious disease in the army. With the exception of enteric fever there has been a considerable increase in the ratio of admissions for infectious and contagious diseases.

Labit has compiled numerous tables of statistics showing the annual incidence of the principal diseases according to years of service.

C. E. P.

Army Medical Service of France: Evacuation of Sick and Wounded by Water from 1743 to 1832.—Méd. Major Ferron (*Archiv Méd. et Pharm. milit.*, June, 1912) has contributed an interesting paper on this subject, showing the extent to which this means of transporting sick and wounded was employed in former times by the French Army Medical Department.

The first mention of the use of water transport for wounded is in the year 1743, the year in which the French and English signed a convention agreeing to respect each others' hospitals, medical, personnel, and wounded. After the battle of Dettingen some of the wounded were evacuated by way of the Maine and Rhine to Alsace.

The next mention is during the wars of the Republic. The decree of 3 Ventose year II (February 21, 1792) contained regulations dealing with the employment of water transport for evacuating sick and wounded. After the passage of the Rhine, by Roche, the wounded were sent down the Rhine to Bonn by night. During the fighting in Switzerland (1799), wounded were transported in ambulance boats on the lakes and also by river to Bâle. In Italy, Southern France, and Egypt, water transport was also employed.

During the Empire, Percy frequently employed transport by water for the evacuation of wounded. After the battle of Jena, wounded were sent by boat along the Maine from Bamberg to Wurzburg; a resting-place was established at Schweinfurt.

During the campaign of 1807, in Poland, an extensive scheme for evacuating wounded by canal and river barges was adopted. The greatest distance traversed was 2,000 kilometres; the barges were drawn by horses and covered 20 kilometres a day, taking three months to complete the journey. In June and July, 12,000 French and Russian sick and wounded were transported via the Frische-Haff from Koenigsberg to Marienberg and Elbing. In August, 13,000 wounded belonging to the French forces were conveyed by water to Berlin, Magdeburg, and other towns. In some cases large covered barges were used. Each held 100 patients. One convoy was composed of twenty of these barges. Three medical officers accompanied each convoy. On the larger rivers, sails were made use of, in the smaller ones the barges frequently ran aground; the Fort of Graudenz being still in the enemy's possession, the barges had to take the smaller division of the river and make the passage by night.

The discomforts were very great; attendants and medicines were not provided; food, except plain bread, was scarce, and many of the sick died from want of proper nourishment.

In 1812, when beginning the Russian campaign, Napoleon organized a scheme of evacuation by water. Rear-Admiral Banto was appointed Commandant of the flotilla of boats and ordered to examine the different water routes in Eastern Prussia and to draw up a scheme for their utilization for evacuating wounded. Each boat was to have as a part of its complement five French bluejackets.

During the wars in Spain, water transport was used for evacuating invalids to Bayonne and Bordeaux, and from thence to the interior of France.

In 1813 and 1814, many sick and wounded were evacuated along the French waterways, notably when Lyons was threatened by the Austrians. In 1814, some 400 patients in hospital were sent by boat to Valence.

During Wellington's advance in 1813-1814, Soult transferred 18,500 men to the hospitals at Dax, Bayonne and other centres, mainly by way of the Adour and Midouze.

During the Siege of Paris, in 1870, twenty-eight river steamers were collected at Joinville and employed from November 30 to December 3, in removing the wounded from Champigny to Paris.

C. E. P.

Water Sterilizers for the German Army.—The Berlin *Neueste Nachrichten* of July 20, 1912, states that the next German army budget will include a sum for the provision of sterilizers for drinking water, for the Medical Store Depots on the line of communication. The method of sterilization is by heat. No further particulars are given.

C. E. P.

Wound of the Heart by Blank Cartridge; Operation Recovery.—Obersarzt Dr. Simon (*Deutsch. militärärzt Zeit.*, August 5, 1912), reported the following case:—

A soldier, wishing to commit suicide, pressed the muzzle of a carbine, loaded with blank cartridge, against his chest over the cardiac area, and fired. Twenty minutes later his condition was as follows:—

In the fourth left intercostal space close to the sternum, there was a funnel-shaped wound about the size of half-a-crown; the edges were blackened and lacerated. He was in a state of collapse; the præcordial dulness extended up to the second rib and from the nipple line to the middle of the sternum. The thorax was opened in the fourth space. Some lacerations of the left lung and a little blood in the pleural cavity were found. The pericardium contained a great deal of blood. In the front wall of the left ventricle there was a penetrating wound 1 cm. in length. This was sewn up and the operation wound closed without drainage. The man made a good recovery. A few weeks later the fourth rib which had been comminuted, but was overlooked at the time of the operation, was resected for a length of 7 cm. The man was invalided out of the Service. When seen ten months later, he was able to follow his occupation, that of a painter.

C. E. P.

Japanese Losses in the Russo-Japanese War.—*The Internationale Revue über Armeen und Flotten, Supplément* 159, p. 236, reprints the following figures from the *Reichspost*, of Vienna, which took them from Surgeon-General Mori's report:

"The total losses in the war were 40,374 dead, and 134,221 wounded. At Mukden there were 16,404 killed, and 53,655 wounded; at Port Arthur, 11,360 killed, and 32,613 wounded. The infantry lost ten times as many men as the cavalry or dismounted artillery. The engineers lost heavily during the siege of Port Arthur. The medical services lost 18 per 1,000 of strength, or nearly the same as the cavalry. The casualties among officers were 120 per 1,000, and among the men 90 per 1,000."

C. E. P.

The Training of German Women as Helpers in War.—A leading article in the *Frauen-Rundschau* of June 7, 1912, calls attention to Geheimer Medizinalrat Professor Witzel's speech at the annual meeting of the Vaterländischen Frauen-verein. He pointed out that Germany's

army of 4,000,000 men should have at least 20,000 women helpers ready to assist the sick and wounded in time of war. Professor Witzel reminded his audience that the wounded, in addition to nursing, required assistance for the repair of clothing, in the preparation of food, and at refreshment stations. This work could be done by women belonging to all classes of society, but to be effectual must be carried out by an organized and disciplined personnel. During the political tension of last summer, the Rhenish-Westphalian Provincial Society instituted training courses for women. These were most successful.

C. E. P.

Recruiting Statistics for the German Army for the year 1910. (*Internationale Revue u. Armeen und Flotten*, June, 1912, p. 193) :—

	1910		1909
Total number liable for Service	1,245,363	..	1,226,730
Excluded on moral grounds	890	..	856
Physically unfit	34,067	..	34,890
Enrolled in 1st ban of Landsturm for social reasons ..	279	..	460
,, ,, ,, supernumerary to requirements	210	..	92
,, ,, ,, on account of inferior physique	144,737	..	137,812
,, in the Ersatz Reserve for social reasons	7,010	..	7,420
,, ,, ,, supernumerary to requirements	3,027	..	4,115
,, ,, ,, temporarily unfit ..	80,262	..	79,597
,, ,, Marine Ersatz Reserve for social reasons	90	..	65
,, ,, ,, supernumerary to requirements	10	..	5
,, ,, ,, temporarily unfit	2,560	..	2,460
Taken for Service :—			
In the Army, combatant corps	201,530	..	205,032
,, non-combatant	2,623	..	2,730
The periods of Service for the contingent was :—			
In the "Train" for 1 year = 2,117			
2 years = 187,412			
3 ,, = 12,001			
For Service in the Navy there were taken :—			
From the agricultural population	8,209	..	6,750
From the seafaring and longshore population.. ..	3,947	..	4,029
In addition there were :—			
Volunteers, one year enlisted in the Army	13,145	..	12,383
,, School teachers	1,066	..	1,024
Other Volunteers	49,886	..	46,114
Volunteers, one year enlisted in the Navy	965	..	930
Other Volunteers	4,104	..	3,562
The total enrolment of all classes in the Army and Navy was	285,445	..	282,554
The number finally dealt with was	558,597	..	550,326
Out of every 100 finally dealt with :—	%		%
The fit were	53·0	..	53·6
Temporarily unfit	14·8	..	14·9
Of poor physique	25·9	..	25·0
Physically unfit	6·1	..	6·3
Morally unfit	0·2	..	0·2

The largest proportion of physically fit was furnished by the Alsace contingent = 66·7 per cent. East Prussia came next with 63·0 per cent. West Prussia 61·0 per cent. Pomerania 56·4 per cent. Lorraine 58·9 per cent. III Bavarian Corps 51·2 per cent; while Brandenburg only had 42·1 per cent physically fit.

C. E. P

Voluntary Aid Detachments and the German Army Medical Service in War.—The official portion of *Das Rote Kreuz* of July 7, 1912, prints a summary of the conditions which must be fulfilled by Voluntary Aid Detachments wishing to be permitted to assist the Army Medical Service in War.

The principal conditions are:—

(1) The detachment must agree to conform absolutely to the rules drawn up by the Central Red Cross Committee for all voluntary aid detachments.

(2) The detachment must report the number of its members who are available for duty on mobilization. The minimum is:—

(*a*) Half the members must be willing to undertake voluntary aid work in the locality where they reside.

(*b*) One-third of the members must be available for voluntary aid work in localities other than those in which they reside.

(3) The detachment must assume the title "Voluntary Aid Detachment of (name of town or village)."

(4) It must send in annually: (*a*) A copy of the rules; (*b*) a list of its members in the following form:—

Number	Member's name	Occupation	Age	Place where military service was put in	State of health	Present military position, Reserve, Landwehr, Landsturm	On mobilization willing to serve (*a*) at home, (*b*) away from home

NOTE.—Those willing to serve under (*a*) or (*b*) must be free from all military service or only belong to the Landsturm.

Any alterations in the detachment, e.g., amalgamation with another detachment, &c., must be reported.

C. E. P.

Correspondence.

FRACTURE OF THE ASTRAGALUS.

TO THE EDITOR OF "THE JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—If the author of the paper on "Fracture of the Astragalus" will look up Cunningham's (or any other recent book perhaps) "Anatomy," he will find described therein the os trigonum (tali). This is the bone he so well displays in his skiagram; there is no fracture of the astragalus shown in it; there is not even the semblance of fracture. Many others may have fallen into the same error. Quite recently a case, with skiagram, of the same condition, was sent to me as being one of fracture. In any collection of skiagrams of this region quite a number will be found showing this ossicle, which is a "variation," and not pathological.

Kasauli, I am, &c.,

September 24, 1912. M. P. HOLT.

CONNECTING LINK BETWEEN FIELD AMBULANCES AND CLEARING HOSPITALS.

TO THE EDITOR OF "THE JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—*Re* the connecting link between Field Ambulances and Clearing Hospitals, may I be permitted to pass a few remarks on an article by Captain Cotton which appeared in the October number of the Journal?

All will agree as to the apparent absence of this link. Opinions will, however, differ as to the method of bridging the gap. Some will say by the Field Ambulances, since these units have their own transport. This would be bad medical tactics, since it entails using a unit designed and intended for the work of collecting wounded, for purposes of evacuating them, and would in practice cause great inconvenience. The other and correct alternative would be to advance detachments of the Clearing Hospital to take over from the Field Ambulances at fixed localities the sick and wounded collected by the latter. This entails the Clearing Hospital or a portion of it having permanent and suitable transport allotted to it, transport which it does not possess at present; and this is the crux.

I think Captain Cotton's term "Collecting Division" unfortunate. The Clearing Hospital is a Lines of Communication unit and entirely engaged in the work of evacuation and not in any sense in the work of collection. Collection is the work of the Field Ambulance. The term "Evacuating Sections" applied to both of Captain Cotton's proposed detachments would suffice, would accurately describe their function and be less likely to cause confusion. To organize such detachments would naturally be one of the first things an O.C. Clearing Hospital would do after mobilization.

I note Captain Cotton proposes that the "divisional collecting station" should be formed by a detachment from the Clearing Hospital. Here we have a unit designed and intended for evacuation being used for purposes of collection. It should also be remembered that the divisional collecting station is the first formed divisional medical post, notified to the troops in operation orders before an action commences; to it would be sent the earliest cases of wounded as the first available dressing station. Its situation is, and can only be, selected by an Official (A.D.M.S. division) who knows how the troops of the division are to be disposed, and who has had an opportunity of reconnoitring the ground. Therefore, how could such a post be formed by a detachment from a clearing hospital perhaps forty miles away and probably without transport? However, for such a detachment from the Clearing Hospital to be advanced at the earliest possible moment and take over the already formed divisional collecting station, and all the wounded there collected and so set free a section of a field ambulance, would be sound medical tactics.

Captain Cotton does not say under whose directions his "Collecting Division" would work. Certainly not under the orders of the O.C. Clearing Hospital, 40 miles away; nor under the D.D.M.S. and I.G.C. These officials are solely concerned in evacuation, and are perhaps still further away. There only remains the A.D.M.S. division, since the post that it is to be this detachment's special duty to form, is a divisional one, and fixed by the A.D.M.S. What does this entail? The detachment of the Clearing Hospital, to be called the "collecting division," will be tactically separated from its own unit, work most of its time in another zone of the lines of medical assistance to its parent unit, and be necessarily under the orders of the G.O.C. division with which it works. Tactical separation soon becomes actual. The practical result would be the creation of a new and independent medical unit, sometimes a line of communication unit, and sometimes a divisional one. What will the general staff say to this? The link between the Clearing Hospital and the Field Ambulances is not so difficult to fill that a new medical unit need be created for the purpose. The problem is solved directly the clearing hospital is given transport. The A.D.M.S. division notifies the D.M.S. the localities and numbers of the wounded collected by the field ambulances. To these places the D.M.S. directs the clearing hospital to send forward detachments to take over the wounded so collected, and dispose of them, that is, arrange for their evacuation.

I am, &c.,
S. H. Fairie,
Major R.A.M.C.

Shoeburyness,
October 17, 1912.

THE "MEANEE" HOSPITAL SHIP, HONG KONG.

TO THE EDITOR OF "THE JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

Dear Sir,—Seeing in the October "Corps News" under the heading "Notes from Hong Kong," that the date when the "Meanee" was first used as a hospital ship in Hong-Kong was not known to the author, I looked up my diary and found this entry when I was stationed in the island: "March 16, 1870, went on board the 'Meanee'; it seems a funny arrangement for the sick of the Army to be treated on the sea, and the sick of the Navy to be treated on the land." This was the case, for just at the time when the "Meanee" came out and was moored in the middle of the harbour, the Navy took over the Seamen's Hospital on shore for the treatment of their sick.

I am, &c.,
S. K. Ray,
Colonel A.M.S. (Retired).

October 17, 1912.

"THE SIMPLE LIFE."

TO THE EDITOR OF "THE JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

Sir,—It is with the greatest diffidence that we venture to break a lance with the author of the paper under the above title which appears in this month's issue, for it is evident from the way he writes that after having lived for nine years in Messes where there were nightly provided "eight or ten absurdities . . . . especially prepared to tempt a palate which would refuse simpler viands," without, presumably, "the strength of mind to sit and watch others eating them," he has unfortunately lost "that optimistic outlook on life, which should be a man's most cherished possession," and so knows something of what he is talking about.

But does it follow that his experience is the experience of the average healthy man? (It is difficult to imagine that one who finds himself unable to pass any of "the eight or ten absurdities" offered to him can be healthy.)

Would it not be as well for him to put his own house in order by "the frequent use of purgatives," which he so deplores, or otherwise? Regular exercise would do wonders for him. Horse-riding would possibly be better than anything, but we do not imagine it to be a recreation which would commend itself. Golf, perhaps, would be the best game for him to take up—of course he could never hope to attain any degree of proficiency at it, not, at any rate, without intense concentration, but the gentle exercise he would get in walking some six or seven miles while playing the ordinary 5,500 yards course, to say nothing of the innumerable concomitant practice-swings, would work wonders with his jaded liver, and after a while he would find no more difficulty in declining the second entrée than the average man has in resisting the temptation to purchase expensive articles which he cannot afford, notwithstanding that they are exposed in the shop windows.

Or, he might try the "bread and cheese and kisses" which he recommends for subalterns, but which should be equally efficacious (or dangerous) for dyspeptic senior captains, unless, indeed, this fatal lack of strength of mind causes him "to endure the ills he knows, rather than fly to those he wots not of." In the event of his taking this latter course, however, he would be well advised to marry a lady in possession of a certificate from the Eustace Miles School of Cookery.

Unlike him, we do not feel that we have a mission (or a liver), and so are content to subscribe ourselves,

We are, &c.,

A Few Moderate Eaters.

October 17, 1912.

SPIDERS' WEB AND MALARIA.

TO THE EDITOR OF "THE JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—It seems of interest to note that the "Dr. Jackson of the British Army," mentioned in the extract from *Notes and Queries*, Second Series, vol. x, July to December, 1860, pp. 172-173, sent by Colonel M. D. O'Connell to last month's Journal, was no other than that great pioneer of medico-military reform, Robert Jackson, Inspector of Hospitals, an interesting account of whose career by Major H. A. L. Howell was published by you in February, 1911 (vol. xvi, p. 120). In the original passage in *Notes and Queries* his Christian name is given, but unfortunately has been omitted in the transcript.

In the number of *The Medical and Physical Journal* for May, 1809 (vol. xxi, pp. 353-359) there appears a long letter to the Editors in which Jackson gives his views regarding the virtues of the Spider's Web, and in reply to the adverse criticisms of "An Essex Practitioner," which appeared in the same periodical, Jackson wrote another letter which is to be found in the number for November, 1809 (vol. xxii, pp. 369-70). In this second letter it is curious to find him remarking, in confirmation of his own observation, that "a lady who lives near the mouth of the Tees, on the Durham side of the river, in a situation where agues prevail in some seasons, has, in the course of her life, cured hundreds by means of this substance, which the Essex Practitioner terms inert."

The "late work by Dr. Jackson on fevers" referred to by Dr. Nathaniel Chapman in the extract from the latter's book in *Notes and Queries*, is his "Sketch of the History and Cure of Febrile Diseases," Second edition, with many additions, 1820, two vols. At p. 309 of the first volume of this work will be found the passages quoted by Dr. Munk.

I am, &c.,

W. JOHNSTON,
Colonel.

Newton Dee, Murtle,
Aberdeenshire,
October 21, 1912.

No. 6. December, 1912. Vol. XIX.

J. J. Fotheringham.
Toronto.

Journal

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Journal

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Original Communications.

SOME OBSERVATIONS ON METABOLISM IN CONNECTION WITH AN EXPERIMENTAL MARCH.

BY COLONEL C. H. MELVILLE, LIEUTENANT-COLONEL W. W. O. BEVERIDGE, D.S.O., AND CAPTAIN N. DUNBAR WALKER.
Royal Army Medical Corps.

IN August, 1910, on the second of the experimental marches described in this Journal (vol. xvii., 1911), an attempt was made to arrive at some idea of the nitrogen balance, and some other points, in those participating in the experiment. Naturally, it was only possible to do this in the case of a few individuals, and the three medical officers were selected for the purpose. These are referred to in the tables and plates as Nos. 1, 2 and 3.

The observations taken were as follows (see Tables I, II and III): weight, energy value of food (approximate), nitrogen in food (approximate), amount of fluid drunk, amount of urine passed, nitrogen in urine and nitrogen in fæces.

The energy value of the food, and the nitrogen in the food, were estimated as follows: The ration served to each officer was carefully weighed on issue, and as far as possible any article remaining unconsumed at the end of the twenty-four hours was also weighed. As far as concerns the biscuits, sugar, jam, tea, pepper, salt, and cheese, the figures may be taken as absolutely accurate. In the case of the meat, vegetables, and oatmeal absolute accuracy was impossible. The total amounts issued were accurately known, and

also the total amount uneaten (as a matter of fact an almost negligible quantity). These articles were, however, pooled for messing purposes and the actual proportion eaten by each officer

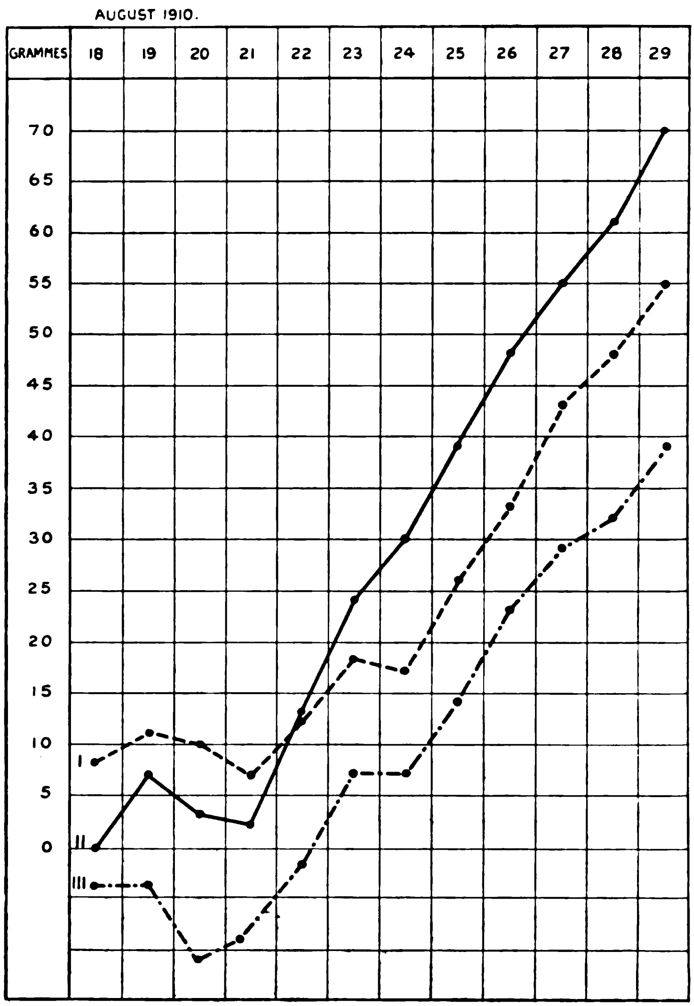

CHART 1.

was of course only approximately arrived at. The greatest care was taken to equalize portions and probably, on the whole period, the error in any one case was not very great. It must be admitted, however, that the figures for "nitrogen in food,"

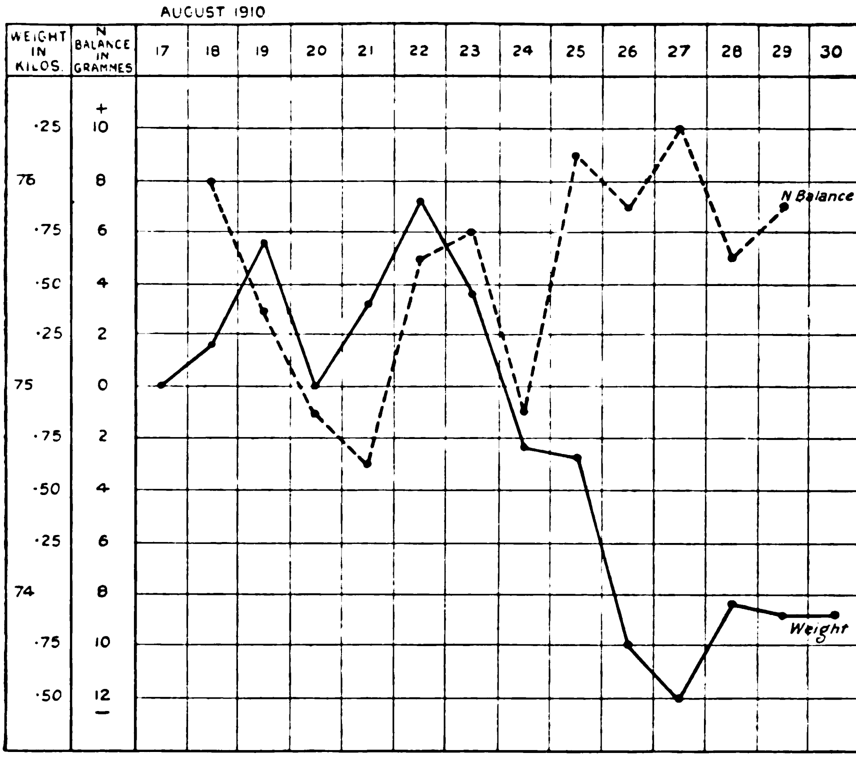

CHART 2. Subject No. 1.

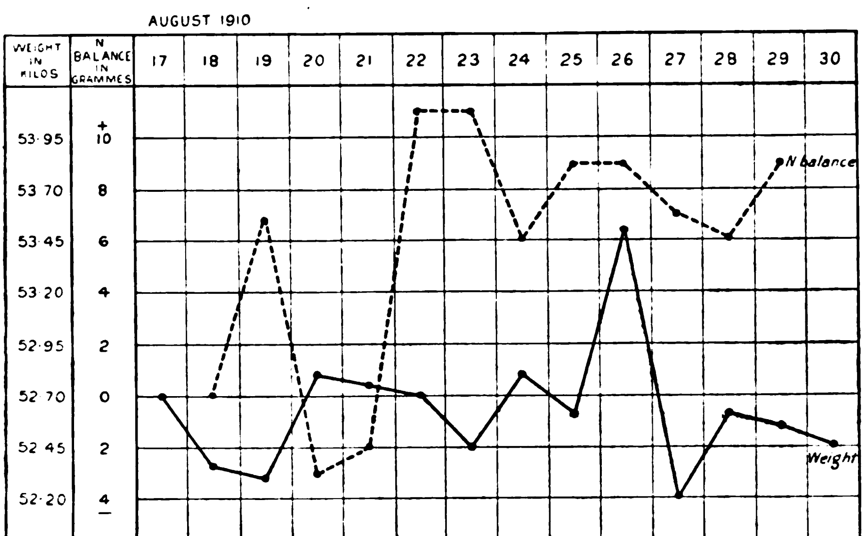

CHART 3. Subject No. 2.

"nitrogen balance," and "energy value of food" are only approximate. Decimal points have therefore been omitted in stating these. As regards the other observations recorded these may be taken as accurate within the ordinary limits of observational error.

In the case of subject No. 3 a series of observations were carried out for a few days before the march, though unfortunately these were not continuous owing to the ordinary exigencies of daily work. The results are shown on Table III, but not much stress can be laid on these, since the ultimate composition of the food consumed by an individual leading an ordinary life is extremely difficult to ascertain.

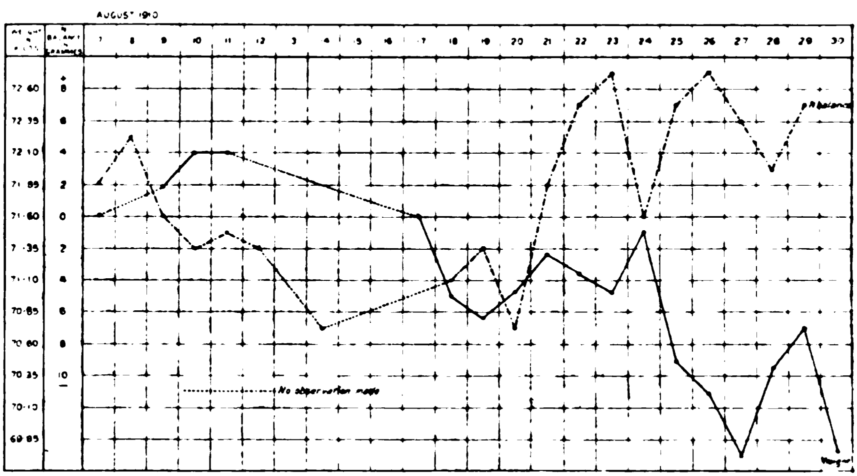

CHART 4. Subject No. 3.

The nitrogen balance of all three subjects is shown on Chart I. This chart shows a "Profit and Loss" account, the increment or defect of nitrogen in any day being added to or subtracted from the day before. It will be seen that all three subjects laid on nitrogen in a very marked manner. The most conspicuous increase occurred in the case of No. 2, the lightest of the party. After him comes No. 1, the heaviest, and lastly No. 3, not quite as heavy as No. 1, who did the hardest work. The parallelism of the three curves is striking, and may be taken as a testimony, to a certain extent, to the accuracy of the observations. In all there is a preliminary period of unsettled balance, lasting three or four days which may be attributed to the disturbance of metabolism due to settling down to camp life, and this is followed in all by a steady rise. It is

interesting to notice that this rise is checked in the case of Nos. 1 and 3 on the same day (24th), on which day also No. 2 shows the smallest increment occurring during this period. On this day occurred the change from tinned meat to fresh, a change which was accompanied by a sudden fall in the estimated nitrogen intake for the day. Since the calculations for intake and output were entirely independent of each other, this coincidence tends to confirm the accuracy of the former calculation. If the decreased intake had been due to under-estimation an increased rise would have been shown in the N. balance.

It will be seen from the Charts Nos. 2, 3, and 4, that there was no connection between the variations in weight and those in the nitrogen balance. Subject No. 1, the heaviest, lost 1·1 kilos; No. 3, somewhat lighter, who did much harder work, 1·9 kilos; whilst subject No. 2 practically maintained his weight, the total fall being only 0·25 kilo, occurring practically in the last four days.

If we assume that the nitrogen retained was utilized in the form of muscular tissue, we see that the true loss of weight in all cases was in reality somewhat greater than the above. Multiplying the nitrogen retained by 6·25 to bring it up to protein, and this again by 5 to represent muscle, we see that the total loss of tissue amounts to :—

In the case of No. 1	..	1,100	+ 1,718 grm.	=	2,818 grm.
,, ,, ,, 2	..	250	+ 2,187 ,,	=	2,437 ,,
,, ,, ,, 3	..	1,900	+ 1,218 ,,	=	3,118 ,,

The work done was calculated in the case of No. 3 on the same basis as that used for calculating the work done by the men of the party (see this Journal, vol. xvii, 1911, p. 535), since this officer carried the same weight as they, and performed all the marches with them. Taking the entire difference between the work done and the energy value of the food consumed over the whole period, we find that there was in the case of this subject an estimated deficit of 9,634 calories. This might be taken as representing a loss of a little over 1,000 grm. of fat. The remaining loss (2,000 grm. roughly) was probably due to loss of water.

On Charts Nos. V, VI, and VII are shown: (1) The total amount of fluid consumed; (2) the same minus the urine passed; and (3) the variations in weight. The amount of fluid actually drunk was carefully measured at the time, and the urine was collected for twenty-four hours and measured. These amounts are therefore exact. The amount of fluid present in the food consumed

is approximate, but there is only room for a comparatively small error here as regards the relative amounts consumed on different days,

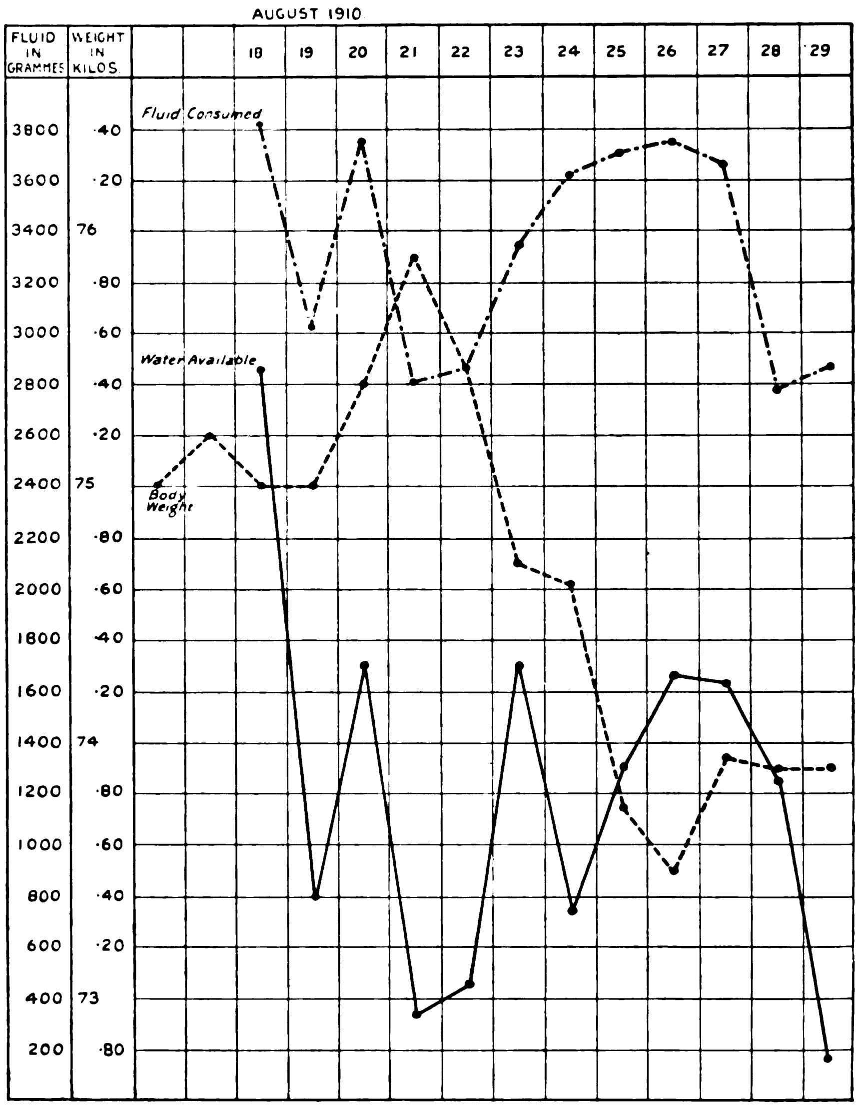

CHART 5. Subject No. 1.

in fact, the error is probably negligible. No soups, stews, or hashes were eaten, the food being cooked, except in the case of porridge,

without added water. In the case of the preserved meat this was minced, made into rissoles and fried with bacon fat. The fresh meat was always roasted. Accordingly, though the absolute amount of water ingested on any particular day can only be approximately stated, the relative amounts taken in in this manner on different days are fairly accurate. The amounts allowed are 850 c.c. per diem, on the 10th, 19th, 20th, 24th, 25th, 26th, and 27th, on the first three of which days fresh vegetables and on the

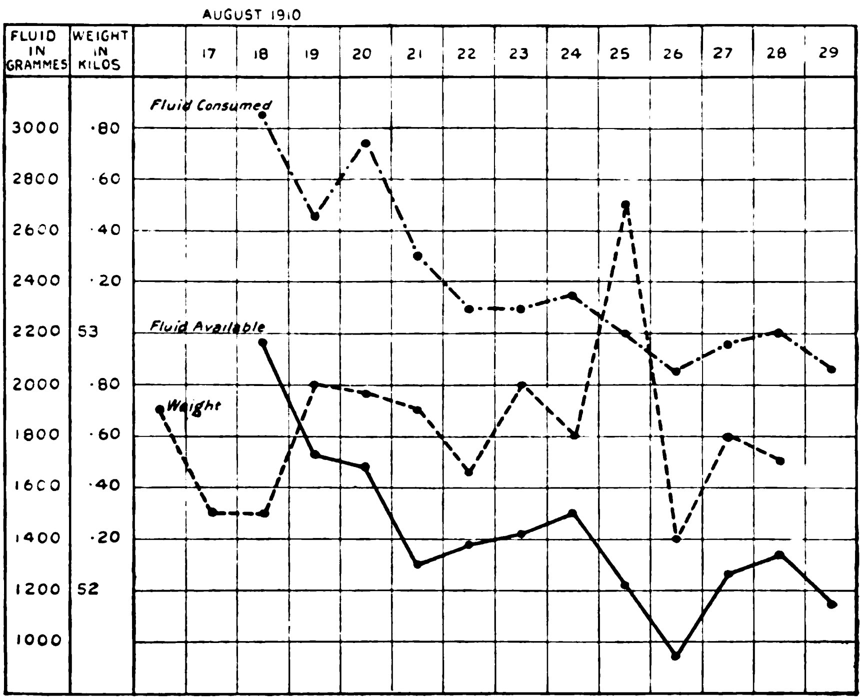

CHART 6. Subject No. 2.

remainder a full meat and fresh vegetable ration were given; 650 c.c. on other days.

In addition to the water actually consumed it is necessary to take into account that resulting from the combustion of the hydrogen of the food. According to van Noorden this may be taken as equivalent to 12 grm. per 100 calories furnished by the food metabolized. The actual energy expenditure is only known (approximately) in the case of subject No. 3. It varies from 3,000 as a minimum, to 4,631 as a maximum, with an average of 4,146. The amount of

water to be credited to this subject on this account would therefore range from 360 to 555 grm. with an average of about 500 grm.

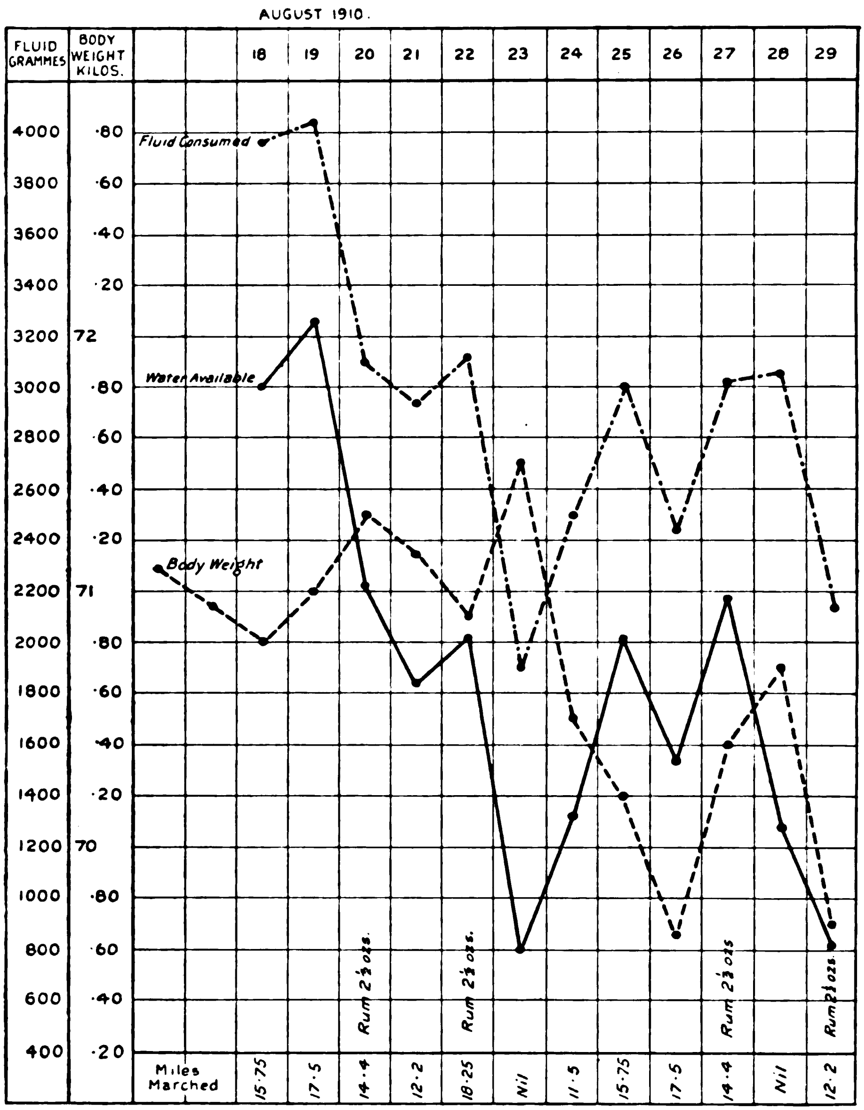

CHART 7. Subject No. 3.

The variations from day to day were comparatively slight, and not sufficient to affect seriously the general trend of the curve given in Chart VII. These figures have therefore been omitted.

The difference between the total fluid consumed and that passed as urine represents the amount available for respiration and perspiration, and should, it might be anticipated, vary directly with the weight. That is to say, that if a small amount of water were available on the 18th, the weight on the morning of the 19th would show a fall. In the charts the curve showing the weights is a day in advance of that showing the "water available," and it will be noticed that, though the curve for weight follows that for water available, there is a distinct lag in the correspondence. A fall or rise in "water available" is followed by a fall or rise in the weight, not on the next day, but on the day after that. The correspondence is closest in the case of subject No. 3, who did the most work. Thus the fall in "water available" on the 20th is followed by a fall in weight, shown on the morning of the 22nd. On this day the former curve shows a rise, followed by a similar change in the weight recorded on the 24th. There is a great deficit of "water available" on the 23rd, and this is followed by a marked fall in weight lasting till the morning of the 27th. The subsequent rally in weight on the 29th might be attributed to the considerable excess of "water available" on the previous three days. Here again the fall in the "water available" on the 28th is followed by a fall in weight on the 30th. Taking next Chart V, which shows the same facts for subject No. 1, who took in comparison slight exercise (a moderate walk of 8 to 14 miles with no load, every day) it will be seen that the correspondence is much less exact. Thus, the fall in "water available" on the 19th is not shown in the weight until the 22nd, and the subsequent fall in the former factor on the 21st does not produce its full effect until the 26th. The rise of the 25th and 26th is shown in the weight of the 28th.

The first call on the "water available" is that for moisture needed to saturate the expired air. The amount of this will vary directly with the CO_2 in the expired air, and this again with the exertion. The variations from day to day will therefore correspond generally to those in the amount of water to be credited on account of hydrogen combustion, already referred to. Since these have been omitted from the table the relations between the variations in "water available" for perspiration and those in the weight may be considered to be fairly shown in Charts V to VII.

It would appear, therefore, that the demand for water for perspiration is not met immediately if there is a deficiency in that available, but is met more rapidly in the case of a man doing hard work than in one leading a more leisurely existence. In the

case of subject No. 2 (see Chart VI) who occupied an intermediate position as regards work, the correspondence between the two curves is more close than in the case of No. 1, less so than in No. 3.

It is interesting to note the extremely small amount of "water available" on certain occasions in the case of No. 1. In this case the amount of urine excreted not infrequently exceeded the amount of fluid actually drunk, though that was considerable. The connection between "water available" and water consumed is (as already stated) much less close in him than in the other two subjects, the presumption being that water ingested and not immediately required on account of work, is thrown out of the body through the kidneys at once.

It is also interesting to note that though the nitrogenous balance seems to point to the fact that protein tissue was being laid on and water being in this way fixed in the tissues, the amount of water available was diminishing. This is particularly noticeable in No. 2, where water available decreased almost as steadily as the nitrogen was accumulated.

The variations in the total amount of fluid consumed are interesting. At the outset the consumption of subject No. 3 was 3,960 c.c., and on the last day 2,180 c.c. In the severe march of 17·5 miles on the 19th the amount consumed was estimated at 4,060 grm., whilst on exactly the same march a week later it fell to 2,430. The relative humidity on the latter occasion approached saturation, whilst on the former it was about 62 per cent, probably the drier air of the earlier date, as well as want of condition, predisposed to greater apparent thirst. This diminution in the consumption of fluid was well marked also in the case of No. 2, who took part in almost all the marches, though without carrying any weight. For instance, taking the two dates already named, this subject consumed 1,800 c.c. of fluid on the first and only 1,200 c.c. on the second. That this decrease was probably almost entirely due to improved condition is shown by the fact that No. 1, who took comparatively little hard exercise, maintained a fairly steady consumption of fluid throughout.

Two practical points in connexion with march discipline seem deducible from these observations.

The first is that if a man has to go short of water for one day the effect on the water available for perspiration, that is, for temperature regulation, may persist, even in a well trained man for about forty-eight hours. The mere fact that a plentiful supply

of water is available on the next day will only tend to increase his urinary secretion, not to redress at once the disturbance in water content of his dehydrated tissues. A similar though perhaps a less marked effect will follow an uneven allowance of water on any one day, as, for instance, when water is not available on a long march, but only at its termination. It is extremely important, therefore, to regulate the supply not only from day to day, but also in the course of every day.

The second point is the importance of training in lessening the demand for "water available" due almost certainly to more efficient "condition." As long as a man is soft, therefore, his water supply needs far more careful regulation than when he has got into good compaigning condition. (It may be remarked that the fluid actually drunk did not include alcoholic stimulants. Water, only, either as such or in the form of tea, was consumed. Rum was issued on four occasions only, in the ordinary service allowance of $2\frac{1}{2}$ oz., on the same dates as it was received by the men.)

Much assistance and advice has been received from Dr. J. Haldane, F.R.S., not only in suggestions for the carrying out the work, but also in the compilation of the reports.

Explanation of Table Headings.

(1) *Body-weight.*—Always weighed after breakfast and before defæcation.

(2) *Work in Calories* (*Subject* 3 *only*).—Work before the march mostly bicycling, except August 13, which represents fourteen mile walk.

(3) *Energy Value of Food.* (4) *Nitrogen in Food.*—Subjects No. 1 and 3 weighed their own food (cooked) for the days before the march, and, using Atwater's tables, the calorie value of and nitrogen in the food have been calculated. The food during the march was issued uncooked, and any unconsumed was weighed and allowed for.

(5) *Amount of Fluid Drunk.*—Both this and the food during the march represent the amount of food consumed and the amount of fluid taken between 7 p.m. and 7 p.m., thus, the energy value of the food shown against August 18 represents that consumed between 7 p.m. August 17 and 7 p.m. August 18.

(6) *Amount of Urine Passed.*—In the same way as in the case of food and drink this represents the amount of urine passed between 7 p.m. and 7 p.m. This rule only applies to the march, the estimations for food and fluid consumed, and urine passed, on the days previous to the march count from midnight to midnight.

(7) *Nitrogen in Urine.*—The twenty-four hour amount was mixed and a sample taken in a glass stoppered bottle ; a crystal of thymol and a small quantity of chloroform were then added, and the bottles stoppered, tied, and waxed. On return to the College the total nitrogen was estimated by Kjeldahl's process.

(8) *Weight of Fæces.*—The total stool was collected in a glass preserved-fruit jar, with an air-tight glass stopper, about 20 c.c. H_2SO_4 were added and the whole well mixed with a small glass rod which was left in the jar. On return to the College these jars were opened and placed in a hot-air oven and evaporated to dryness, then cooled, weighed, the jar cleaned out, and weighed ; the differences in these weights are the figures shown under the above heading. The whole mass was ground in a mortar, and 1 grm. taken for each determination of nitrogen by the Kjeldahl process.

0.004 grammes of nitrogen have been deducted for the paper used at each evacuation.

(9) *Nitrogen Balance.*—The amount of nitrogen in the stool of August 19 has been subtracted from the amount of nitrogen in the food of August 18, and the result has been compared with the nitrogen in the urine of August 18. On the days when there was no evacuation, half the amount of the nitrogen of the next stool has been deducted.

TABLE I.

SUBJECT No. 1.

Date	Body weight	Energy value of food	Nitrogen in food	Amount of fluid drunk	Amount of urine	Nitrogen in urine	Weight of fæces (dry)	Nitrogen in fæces	Nitrogen balance
	Kilos.		grm.	c.c.	c.c.	grm.	grm.	grm.	
Preliminary Period—									
August 7	..	2,053·3	11	1,160	1,650	11·55	..	1·50	− 2
,, 8	..	2,008·5	9	1,215	1,780	10·06	40	1·62	− 3
,, 9	..	..	..	..	..	..	52		
,, 11	..	1,936·3	12	975	2,850	11·09	..	1·73	
,, 12	..	..	..	..	2,160	10·04	39	..	− 1
March Period—									
,, 17	75·00	..	..	..	..	..	..	3·91	
,, 18	75·20	2,503	22·00	2,975	970	10·64	231	3·44	+ 8
,, 19	75·00	2,600	24·00	2,175	2,245	18·35	77	2·70	+ 3
,, 20	75·00	2,427	17·00	2,900	2,020	15·39	65	2·45	− 1
,, 21	75·40	3,244	20·00	2,125	2.425	18·06	50	4·75	− 3
,, 22	75·90	3,373	24·00	2.200	2.395	15·44	114	3·96	+ 5
,, 23	75·45	3.460	24·00	2,900	1,795	15·02	90	2·59	+ 6
,, 24	74·70	3,470	19·00	2,864	2,970	14·55	110	5·65	− 1
,, 25	74·65	3.355	23·00	2,850	2,400	11·89	165	2·16	+ 9
,, 26	73·75	3,355	23·00	2,900	2,055	13·52	65	2·38	+ 7
,, 27	73·50	3,553	23·00	2,800	2,010	13·22	92	·11	+10
,, 28	73·95	3,216	21·00	2,100	1,500	15·41	15	·84	+ 5
,, 29	73·90	3,833	23·00	2,200	1,670	15·43	33	..	+ 7
,, 30	73·90	..	..	..	..	..	*Nil*		

TABLE II.

SUBJECT No. 2.

Date	Body weight	Energy value of food	Nitrogen in food	Amount of fluid drunk	Amount of urine passed	Nitrogen in urine	Weight of fæces (dry)	Nitrogen in fæces	Nitrogen balance
	Kilos.		grm.	c.c.	c.c.	grm.	grm.	grm.	
March Period									
August 17	52·70	..	..	..	..	..	48	1·68	
,, 18	52·35	2,372	19	2,220	912	15·96	104	2·83	±
,, 19	52·30	2,437	26	1,800	910	18·11	55	1·25	+ 7
,, 20	52·80	2,260	16	2,100	1,270	17·60	85	1·77	− 3
,, 21	52·75	2.174	18	1,850	1,210	18·47	50	1·54	− 2
,, 22	52·70	3,637	24	1,640	920	13·39	*Nil*	*Nil*	+ 11
,, 23	52·45	3,324	26	1,635	875	13·30	50	1·62	+ 11
,, 24	52·80	3,714	20	1,500	840	12·32	54	1·84	+ 6
,, 25	52·60	3,780	25	1,350	990	14·02	55	1·78	+ 9
,, 26	53·50	2,943	24	1.200	1,105	14·85	7	1·14	+ 9
,, 27	52·20	3.685	22	1,300	910	12·51	85	2·78	+ 7
,, 28	52·60	3,089	23	1,350	870	15·27	48	1·58	+ 6
,, 29	52·55	3,615	24	1,200	920	13·13	13	1·57	+ 9
,, 30	52·45								

TABLE III.—Subject No. 3.

Date	Body weight (stripped)	Calorie value of food	Work in calories	Amount of fluid drunk	Amount of urine passed	Weight of fæces (dry)	Nitrogen in food	Nitrogen in urine	Nitrogen in fæces	Nitrogen balance	Carbo-hydrates in the food	Fat in the food	Protein in the food	Respective Proportions: Protein	Fat	Carbo-hydrates	Ether extract (fæces)
	Kilos.			c.c.	c.c.	grm.	grm.	grm.	grm.		grm.	grm.	grm.				
Preliminary Period—																	
August 7	..	3,168	3,880	1,660	1,307	..	20	17·5	1·5	+ 1	330	159	122	1	1·00	3·00	
,, 8	..	2,853	3,667	1,772	1,057	62	24	17·3	1·2	+ 5	284	119	147	1	·75	2·00	
,, 9	71·84	2,526	3,593	1,188	1,220	58	20	18·4	1·6	± 0	265	110	126	1	1·00	2·00	
,, 10	72·10	2,757	4,110	1,460	1,350	59	22	20·0	4·7	− 2	381	107	136	1	1·00	3·00	
,, 11	72·10	2,609	3,675	1,410	1,460	103	21	20 8	1·2	− 1	369	128	131	1	1·00	3·00	
,, 12	..	2,828	3,350	1,222	1,198	59	19	19·2	2·0	− 2	308	135	130	1	1·00	2·00	
,, 13																	
,, 14	..	2,883	3,000	1,880	1,155		15	20·0	1·9	− 7	332	149	95	1	1·50	3·50	
,, 15	..	..	..	..	..	51											
,, 17	71·60																
										+ 6 / − 12 / − 6	324	129	127	1	1·00	2·50	
March Period—																	
August 18	70·95	2,276	4,433	3,110	960	46	17	19·1	1·5	− 4	337	87	107	1	·75	3·00	
,, 19	70·80	2,363	4,541	3,190	780	61	18	16·8	1·5	±	364	88	111	1	·75	3·00	
,, 20	71·00	2,011	4,262	2,240	890	30	14	19·3	2 2	− 7	314	46	88	1	·5	3·50	
,, 21	71·30	3,137	4,025	2,290	1,100	58	24	19·3	3·0	+ 2	408	173	147	1	1·00	2·00	
,, 22	71·15	3,843	4,631	2,470	1,115	98	25	15·3	2·8	+ 7	448	176	157	1	1·00	3·00	2·7
,, 23	70·90	3,763	3,000	1,250	1,130	90	27	16·1	1·9	+ 9	444	179	172	1	1·00	2·50	1·1
,, 24	71·50	3,952	4,001	1,640	1,170	63	22	20·8	·7	± 0	438	173	136	1	1·25	3·00	
,, 25	70·45	3,526	4,433	2,160	1,000	31	24	15·2	1·9	+ 7	412	171	148	1	1·00	3·00	0·17
,, 26	70·20	3,720	4,541	1,580	885	57	25	15·7	*Nil*	+ 9	441	172	156	1	1·00	3·00	
,, 27	69·65	3,697	4,262	2,155	830	*Nil*	23	15·5	1·1	+ 6	412	171	141	1	1·00	3·00	
,, 28	70·40	3,865	3,000	2,410	1,780	40	26	19·2	3·5	+ 3	482	176	161	1	1·00	3·00	
,, 29	70·75	3,967	4,625	1,500	1,340	70	26	19·3	*Nil*	+ 7	460	176	166	1	1·00	3·00	
,, 30	69·70	..	..	..	..	*Nil*											
Totals ..		40,120	49,754							− 11 / + 50							
Averages..		3,343	4,146							+ 39	413	149	140	1	1·00		

ORGANIC DEVELOPMENT ON THE EARTH: THE EVIDENCE AND ITS MEANING.[1]

By Colonel R. H. FIRTH.

This article is an attempt to systematize certain thoughts suggested by a perusal of the Hunterian Lectures of 1912.[2] The dominant impression left on one after reading those lectures was the enormous time period, associated with a wide geographical dispersement, covered by the evidence concerning the early origin of modern man. Further, the evidence, so lucidly explained by Keith, suggests that the evolution of the forms held to be archetypes of men proceeded with some irregularity and, if read in conjunction with other evidence concerning organic development as a whole, conveys teachings and warrants inferences of an ethical value. An early difficulty is, what was the cause of this irregularity? The explanation seems possible only by an examination of the facts bearing on the evolution of life generally on the earth, or, in other words, by correlating geological and biological facts. Leaving, therefore, on one side the peculiar evidence relating to man we may pass first to a consideration of the evidence which throws light on organic development as a whole. This evidence is partly geological, partly biological, and in both respects is associated closely with the physical or dynamic forces which have affected the earth's crust in its evolutionary changes through time.

I.

To appreciate correctly what these forces have been we must first go back to the beginning of things. Whether we think of our earth as having been originally a cooling mass of liquids, or, preferably, as a globe which after it had solidified continued to add to its bulk by accretions drawn from surrounding space, we must admit the intimate relationship between any organic development upon it and its early variations in climate or temperature, and also that any organic development was fundamentally influenced by vast movements of the earth's crust which at more than one period have occurred with probably periodic alterations in the shape of the earth itself. It is convenient to consider, at the

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[1] Received for publication on May 28, 1912.

[2] *British Medical Journal*, March 30 and April 6, 1912.

outset, these physical influences in reverse order, before passing to other arguments or evidence.

The causes which produced alterations in the shape of the earth have probably themselves changed as to their degree of influence. The first cause was an inherent instability of the earth's mass, due to the fact that although the crust was hard or solid, yet it covered or rested upon a core of viscous magma representing rock in a liquid state as the result of pressure. The effect of this physical state was that the crust and the whole mass of the earth offered an imperfect resistance to forces of attraction and compression. We have evidence of this, in that the centre of gravity of the earth is even now not coincident with the centre of its figure. This instability due to inadequate resistance to compression is comparatively small at the present time as the earth is harder now.

Further, changes in the shape of the earth have been associated intimately with distributions of land and sea on its surface, and their causes have been either withdrawn or lessened in potency. All these changes on the surface of the earth have apparently manifested themselves spasmodically, that is when the accumulation of the interior stress reached a point when readjustment became necessary to afford relief. These powerful influences have been affected by the lessened speed of the earth's rotation. This has tended, on the one hand, to reduce the heaping up of the waters towards the equator, while, on the other hand, it has tended to smooth down the earth's own bulging at the equator. Any reduction or change in the earth's figure from these influences has been expressed by subsidences and consequent earthquakes in equatorial regions. The summation effect of the two acting together on the distribution of land and ocean would be, and probably has been, the occurrence of long periods when the ocean advanced towards the poles, followed by short periods when it retreated from them. It is possible that these events are still in progress. Whether the various forces here outlined have been the only forces at work or not, the fact of a series of slow elevations and depressions of the earth's surface is undoubted. The most probable sequence of events was the very slow elevation of great beds of strata deposited along the coasts of a continental mass, followed immediately by a process of denudation by rain until the whole mass became worn away into valleys and lowlands. Then followed a quiescent period culminating in subsidence leading to fresh deposits on the lowered area. These subsidences, by pressure of the weight of the deposits on them, would lead to a re-elevation of adjacent land-strips by

a crumbling or folding up and a subsequent repetition of the whole process. To understand these subsidences we must conceive, what is probably a fact, that the core of the earth was and is still nothing but a mass of rock maintained in a condition of viscosity and great heat by pressure alone. On this viscous, heated mass the crust rests, and any lines of weakness in that crust during the past and present must be associated with both volcanic activity and subsidence.

To arrive at any conception of the temperature or climate of the early earth, we must dwell for a moment on the heat of the first nucleus and also on the nature and source of the earth's primal gases. If all the planetismal fragments which made up the nucleus of the earth had converged simultaneously, their collision would have been enough to melt the whole mass; however, it is unnecessary to assume this, but rather take the view that in the years of its early history the earth was constantly acquiring planetismal additions whose impacts were enough to keep it at a great temperature, and that only later when the fragments in its path were few and far between did its surface cool. Even had there not been enough collisions to keep it hot, it is conceivable that the earth inherited or started from a hot nucleus. Further, as the young earth grew and probably received additional material, it must have undergone contraction with compression of its mass and this very compression must have been another cause of internal heat. This heat went on rising as long as the compression was sufficient to generate heat faster than the planet lost it. Apart from these sources, the heat arising from the rearrangement of the molecules of its constituent fragments must have been enormous, to say nothing of the heat available from radio-active action of the earth's other constituents. Therefore, in whatever way we think of the early conditions, we find no difficulty in believing that in the early years of the earth its surface must have been much hotter than now and that its atmosphere also was warmer. In later ages thermal equilibrium was established, disturbed and re-established.

Probably when the earth was very young it had no atmosphere, as its mass did not possess sufficient gravity to hold the atmospheric molecules together. But as it grew it became able to fold such an envelope about it. What the earliest atmosphere consisted of must have depended upon the gaseous molecules which rushed into the earth's sphere of attraction, supplemented by such gases as were present in the parent nucleus or nebula around which the earth was built; to these gases others were and probably are now added

from the meteoritic masses constantly reaching the earth. As we know that hydrogen, carbon monoxide and dioxide, also nitrogen in small amounts, are shut up in meteorites and the rocks of this day, we can assume that these were the gases shut up in the rocks of the early earth. Their chemical interactions were probably the same then as now, with the result that for the constituents of the earliest atmosphere we can postulate chiefly water vapour, carbonic acid and nitrogen. The relative amounts of each would depend on the ability of the earth to hold them to itself, and the heavier the molecules of the gas the larger the quantity of the gas retained. For those reasons, we can assume that carbon dioxide was held before oxygen, a still longer time before nitrogen, and all three a considerable time before the vapour of water. The existence of free oxygen in the earth's atmosphere presents some difficulties; it existed probably in the parent nebula, or possibly the planetismals when they joined the earth's mass may have produced sufficient energy to release oxygen from water vapour; while later on, when plant life began, the plants would be sources of oxygen and add it gradually to the atmosphere. Important as the oxygen was and is for the development of organic forms on the earth the relative amount of carbon dioxide is hardly less so, as the gas being a great absorber of heat any great change in its quantity would produce marked results not only chemically but in climate. In the early volcanic era of the earth the volume and pressure of carbon dioxide in the earth's atmosphere must have been far greater than it is now, also the oceans warmer, and the chemical interchange between the air and the waters must have played a great part in the formation of the sedimentary strata. It is difficult and perhaps useless to speculate how the existing balance of gases in the atmosphere has been reached, the most we can say is that the magnitude of changes required to produce any great variation is almost unthinkable.[1]

Having thus formed a mental picture of the atmosphere of the early earth, and perhaps too of its composition during the intermediate ages, we are in a position to think of what the climatic conditions must or may have been. That there have been changes in the climate of this planet there is indisputable evidence, but practically no evidence that the climate of any part of the earth has materially altered in the last three thousand years. What variations in climate occurred before then we can only guess, but

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[1] Grew. "The Growth of a Planet." London, 1911.

whatever they were we can safely affirm that they were due to huge alterations in the distribution of sea and land, which again were referable to deep-seated efforts of the earth to attain equilibrium. We know that a great expanse of land accumulates and intensifies extremes of temperature, while large ocean areas modify these extremes and conduce to an equable climate. When a period of land domination followed one of ocean domination on the earth, the equable climate preserved by the latter gave place to extremes ushered in and maintained by the land areas. Synchronous with these changes would be oscillations of the relative quantities of carbon dioxide and of oxygen in the sea and the atmosphere, accompanied by the formation of new currents both in the ocean and in the air. The establishment of new conditions such as these would lead to differentiation of temperatures and profound climatic disturbance associated with the formation of vast, new and permanent areas of high or low barometric pressures. These in their turn would produce more or less permanent anti-cyclonic or cyclonic areas. We know that the present-day glaciations of Greenland and Alaska are within permanent cyclonic areas. It may be that the glacial periods of the past on different parts of the earth's surface, and separated by thousands of years in time, have been produced by any or all of these effects. From these considerations we are forced to conclude that the climate of the earth has been but a product of the various stages of the earth's evolution, though the record of its progressive changes is not clearly written.

II.

Our thoughts, so far, have been directed to a consideration of the forces that have been at work in continually moulding and remoulding the earth's surface. Thus, in alternate belts or extended areas we can conceive how our continents have been built up throughout the ages, with repeated alterations of land and sea, of mountain and valley; while concurrent with if not antecedent to these purely terrestrial changes, there have been gigantic cosmic changes due to astronomical causes leading to alternations of hot, short summers with long, cold winters, and the reverse; culminating at enormous time intervals in warm and equable climates over the whole land surface, and at other rarer and shorter periods in more or less severe glacial ages. That due regard be paid to these considerations is essential, as it is to this long series of physical modifications of the earth's surface, accompanied by changes of

climate, that we owe or can trace the great motive power for the work of organic development. But before we attempt to consider the mode by which organic development has been brought about, it is necessary to think for a while as to the possible geographical aspects of the eras which mark the earth's life through the ages. As the evidence on which any mental pictures can be formed in regard to this is geological, it may be helpful to the casual reader to explain briefly the names and chronological significance of geological eras in current use.

The first or oldest era is the *Archean*. The relics of this age are the archean rocks; these underlie the whole surface of the earth, and whenever they come to the surface all later formations are undiscoverable. They are most obvious in Canada, present in the outer Hebrides, also over Northern Europe, in France, Spain, also in India, North China, Japan, Australia and New Zealand. The second era is the *Palæozoic*. This contains five periods as represented by geological formations which in order of antiquity are the Cambrian, the Silurian, the Devonian, the Carboniferous and the Permian. The third era is the *Mesozoic*, which contains the Triassic, the Jurassic and the Cretaceous formations. The fourth era is the *Cainozoic*, which includes such formations as the Eocene, the Oligocene, Miocene and the Pliocene. The fifth era is the *Neozoic*, which embraces the so-called Pleistocene formations. Between the Cainozoic and Neozoic eras there seems to have been a glacial period, and during the actual Pleistocene period at least three other ice ages. What the duration of this Pleistocene period has been we do not know, but probably it has not been less than half a million years. To a large extent each of the formations has certain characteristic types: thus, the Trilobites of the Palæozoic era, the Ammonites of the Mesozoic strata and the Nummulites of the Cainozoic era. This is but a general statement, for the end of one group of fossils coincides rarely with the beginning of another; in fact, the limits of typical forms are mixed in a most hopeless way. Moreover, the sedimentary formations laid down at the same time in different parts of the earth have not always identical characteristics. This suggests that they must have been laid down under different conditions, as for instance, probably, the sea advancing in one case and retiring in another. Evidence of this kind helps to show that in the ages long past the advance or retreat of the oceans has been irregular. For example, there is geological evidence which indicates an advance of the oceans some time between the Palæozoic and Mesozoic eras over

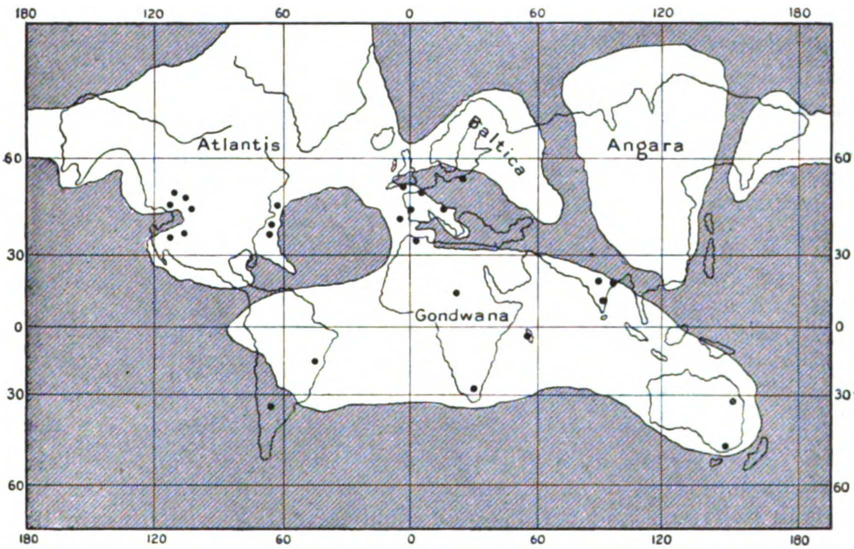
England, Russia and North America, but this advance is not traceable in Southern Europe, Africa or India, where the transition from the Palæozoic to the Mesozoic eras goes on unbroken. Similarly, in the Mediterranean basin by the absence of Eocene formations there is a break between the Mesozoic and Cainozoic eras, which elsewhere is not so. Many instances of this kind are known; they point to one conclusion, that the coast lines on the surface of the earth were continually being shifted, and often so slowly as to require the whole of a period, possibly amounting to a million or more of years, to show any effect. These facts hint sufficiently as to the difficulties in the way of our forming any exact conceptions of what have been the various arrangements of land and ocean on the earth's surface in the ages which cover its history. The most modern and comprehensive attempt to make any such delimitation is that of Suess.[1] The following is practically a summary of his views.

At the close of the Silurian period the ocean fell back, leaving bare the whole region between Illinois and the North of Russia; that is, the whole North Atlantic region, the east of Canada, Spitzbergen, Great Britain and the north of Russia were dry land. Then the ocean advanced again and by the middle of the Devonian period Russia, Scandinavia, Northern Europe, the British Isles, the United States, Canada and the Arctic regions were under water. At the beginning of the Carboniferous period, the ocean fell back, but advanced again till the marine sediments which mark the Permian period covered the greater part of North America and of Northern Europe. This gigantic submergence brought the Palæozoic movements to an end. During the early Mesozoic era, nearly all Europe was under the sea and probably much of North Africa as far as Abyssinia. In the Triassic and Jurassic periods the ocean fell back, leaving Central Europe and Russia dry land. At this stage the Cretaceous era began and the ocean advanced till it submerged the Jura ranges, all Europe, including Russia, and the southern sea joined the northern as one huge ocean. This southern sea also submerged what is now Algeria, Tripoli, Egypt, the Sahara, Syria and Arabia. Once more vast areas were abandoned by the sea, the Cretaceous period came to an end, and gradually what we now call North America, much of South America, and Northern Africa came into being

[1] Suess: "The Face of the Earth," 4 vols., translated from the German by Sollas. Oxford: The Clarendon Press. 1910.

in the form much as we know them now at the beginning or middle of the Cainozoic era. The sequence of events after the middle of the Cainozoic age appears to be undecipherable from geological facts.

In his analysis of the conditions, Suess indicates that of the present day continents of Asia, Africa and Europe only parts existed in their present form in the early ages. The most ancient of these are South Africa, most of Central Africa, Madagascar, and India. These areas probably have never been under water since Palæozoic times. At one time these land masses were one huge



NOTE.—The black dots indicate discovery of Dinosaurian remains.

continent to which the name Gondwana has been given. North of this were other plateaux which were submerged in the Cretaceous period and remained more or less so until well into the Cainozoic era. As the result of this prolonged submergence a broad zone of sedimentary deposits is traceable from Tunis through Asia Minor to the Pamirs and the Himalayas. This ocean area was the ancient sea of Tethys, and our present Mediterranean is probably a relic of this old sea. Still further north was a plateau, now Eastern Siberia, and judging by the nature of the deposits still recognizable over Siberia, Mongolia and China, it is likely that once there was an ancient continent to which the name

Angara has been given. Towards the close of the Mesozoic era, the sea of Tethys disappeared and the union of the ancient Angara with the more southern lands gave rise to Asia as we now know it. Owing to the presence of Archean rocks in Canada, there is reason to believe the existence in remote ages of a lost continent known as Atlantis which, on the evidence of Palæozoic sediments in Western Europe, may have occupied the present North Atlantic; a remnant of it seems to exist as the Greenland of our day. Of the southern continents we find the Falkland Islands to be a folded fragment of Palæozoic times, and certain ancient strata now recognizable in South America suggest an extension of the old Gondwana to what is now Brazil and Argentina. Of the more southerly land areas we know little, except to speculate on a lost Antarctica reaching from Patagonia to Australia. The accompanying figure is a hypothetical scheme of the distribution of land and ocean in Mesozoic times. It is taken from an interesting article by Lull on the distribution of Dinosaurian remains,[1] a point to which reference will be made later on.

III.

Our reflections to this point have enabled us to appreciate the extent of the changes on the earth's surface during the successive periods of its existence, and also to realize the magnitude of the forces which have been concerned in those changes. We need now to think of how organic life developed on the earth; the evidence of this development is available only from the records left in the rocks and various geological formations. Unfortunately the evidence is far from being complete, there are many breaks, but it is sufficient to enable us to form some conception of the changes in the world of life which have characterized each age. Whether we consider the plant or the animal world we find it developing progressively, and conforming to the law of adaptation to the varying conditions on the earth's surface; as to both plants and animals our evidence is from fossil remains, but, unfortunately, much of their history lies beneath the oldest fossiliferous formations. In this place we need not think of what was the origin of either form of life, for we know nothing about it, but rather should rest content with the view that it is as probable that life began on the earth with many things as with one.

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[1] *The American Journal of Science*, vol. xxix., No. 169, January, 1910.

The inherent delicacy in structure of a living plant explains the many gaps in the geological records of past plant life, but in spite of this, sufficient fragments are available to enable us to form a fairly accurate idea of what were the facts. Numerous frond-like impressions have been found in the Cambrian and Silurian rocks; these are held to be casts of seaweeds or relics of algæ, but practically there is no evidence of land forms from those times. In the Devonian beds, remains of ferns and the lower gymnosperms are fairly common, the mosses and liverworts are missing, but there are relics of forms intermediate between the ferns and the cycado or sago palms, and also of what would seem to have been a gigantic ancestor of the modern horsetail. It is not until the Carboniferous period that we find free evidence of higher plant life; in that period it was abundant. The types were ferns, transitional ferns, fern-like conifers, horsetails which were trees in those days, an extinct group of sphenophylla and huge lycopods or club mosses. If we could see the luxuriant forests of the coal period we should find they presented the aspect of the vegetation in a tropical fern-house of a botanical garden. One class of plant seems to have stood out from all the rest during the Carboniferous period; this was the class of Cordaiteau trees, the nearest modern type being the maiden-hair tree. This ancient Cordaiteau tree had even then cast aside all traces of the cryptogamic habit and had advanced to be a typical seed-plant. Many other fern-like plants of that period are known now to have borne on their fronds, not the spore seeds of a fern but true seeds, as perfect as those of the Cordaiteæ themselves. These facts, which have been worked out by Oliver and Scott[1] are of great interest as they indicate that, of the two great Palæozoic seed-bearing species, the more advanced Cordaiteæ were the direct ancestors of the Coniferæ and the fern-like Pteridosperms or club mosses and horsetails were the forerunners of a cycadophyte flora to be found in the fossil remains of the next or Mesozoic era.

In the Mesozoic age, plant life was abundant and the characteristic flora was fully established during the early Triassic period and the vegetation seems to have maintained a remarkably uniform character up to the early Cretaceous era. During all this time ferns, club mosses and horsetails were numerous, but the bulk of the land vegetation was gymnospermous. These gymnosperms

[1] Scott. "Studies in Fossil Botany." London, 1908, also "The Evolution of Plants." London, 1910.

were Coniferæ such as pines, yews, cypresses and araucarias, also Ginkgoales similar to the maiden-hair trees of our day, and Cycads similar to *macrozamia*, *bowenia* and *stangeria* of modern times. All these are natives of tropical regions, being handsome plants with foliage not unlike some palms, whence their popular name of Sago palms, as a kind of sago is obtained from them. The Cycads of Mesozoic times had a world-wide distribution, as their fossil remains have been found from the tropics all through the temperate zones into Greenland and Siberia. They are common in the Portland quarries, where the workmen call them "crow's nests." From an evolutionary point of view the fossil Cycads are of the first importance as they form a connecting link between the anomalous Palæozoic seed plants and the flowering plants or angiosperms of the late Mesozoic, the Cainozoic and recent times. It is probable that all the dicotyledons sprang from the Cycadophytes which overspread the world in the Mesozoic age. We cannot trace the monocotyledons by fossil remains and can only suppose that they branched off from the Dicotyledons soon after the latter specialized out. The well-attested fact of so typical a family as the palms in the Cretaceous rocks is quite unexplained. The notable dominancy of the flowering plants in the Mesozoic era, as in our own age, was due probably to their adaptation to contemporary insect life.

The development of plant life generally in the late Cainozoic and Neozoic periods up to recent times is most imperfectly traceable from fossil remains; we can only assume that, like other forms of organic development, the plants adapted themselves to physical conditions. If the plants of late periods seem to us more perfect than those of earlier times, it is because they are adapted to more complex conditions. However far back we follow the fossil records, we never meet with badly adapted plants, only with plants adapted to an environment different from the present. The complexity of fossil seeds found in the Palæozoic strata suggests a spermatozoid mode of fertilization, which is also notable in the modern Cycads and maiden-hair tree. It would seem as if evolution demanded and secured a medium for the movements of the active swimming sperms discharged from the pollen grains; water for them to swim in was a necessity for propagation during the early ages. In later days the evolution of the pollen tube is traceable and allowed of a gradual simplification of the seed and its containing ovule. Clearly, under the circumstances which prevailed in the early Palæozoic time, the seed of the seed-bearing plants was a very perfect mechanism.

In contemplating the development of animal life on the earth, we find that fossil remains tell us when and where certain types began and ceased, but the connexion between them is much more difficult to trace than in the case of plant life. The ability of animals to move about subjected them to different kinds of environment ; thus, the mutations of animal species were assured. Plants, on the other hand, being immobile were subject to similar conditions for ages. If we attempt to think of the advance, pause and decline of animal species, we find the following facts, which, if not quite satisfactory as explicable of the conversion of one species into another, are suggestive of a line of descent from one geological period to the next.

The animal fossil remains found in the Cambrian rocks are of lowly marine forms allied to sponges, crinoids and annelids. There are also many shell-bearing Mollusca, also some highly organized crustaceans such as water fleas and the trilobites. Besides these terebratulæ and the genus lingula undoubtedly existed. These evidences of marine animal life in such an ancient formation as the Cambrian suggest that animal life existed in the formation below it, and that, long before the Cambrian period, the world must have swarmed with living creatures. Fossil remains are not recognizable in the Archean rocks, as the whole mass has been metamorphosed by heat and pressure, but the inference is forcible that our oldest geological records only carry us some half-way back along the whole period during which life has existed upon the earth. In other words, from geological records, both plant and animal life on the earth have no known beginning. In the long series of the Silurian formations, more varied forms are found of the same classes present in the Cambrian, but with the addition of jawless fishes who also appear to have had no bony skeleton. In the succeeding Devonian period these primitive fishes died out and their place was taken by true fishes somewhat allied to our sharks. In this and the Carboniferous age, a large number of arthropods, insects such as mayflies and cockroaches, also crustacea seem to have been common; but the great advance towards the higher land animals is also to be found at this time, namely, the appearance of strange amphibia known as Labyrinthodontia. These curious creatures, a cross between lizards and crocodiles, were abundant during Carboniferous and Permian times, but seem to have died out in the subsequent Triassic age.

Coming to the Mesozoic epoch, the fossil remains indicate a wonderful change in the forms of animal life. The archaic fishes

disappear and the labyrinthodonts give place to true reptiles, which again seem to have developed rapidly into huge creatures of strange form having a superficial resemblance to the true mammals which quickly followed them. Some early reptiles were undoubtedly carniverous and others herbivorous. Their remains have been found in Cape Colony, India, Europe and North America, but always in the Permian or Triassic formations. There is much to suggest that the modern monotremes of Australia are their descendents, though the intermediate forms are missing. The turtles and tortoises appear fully formed in the late Triassic or early Jurassic beds, as do the crocodiles, the aquatic lizards or Plesiosaurians, and Icthyosaurians, the flying Pterodactyls or bird lizards and the gigantic Dinosaurs. The general distribution of these latter reptiles is shown in the sketch illustrating the land and water distribution of this period. Some of these Dinosaurs were aquatic, some terrestrial and some amphibious. All were adapted to the varied modes of life which modern higher warm-blooded vertebrates have attained. The aquatic forms anticipated our smaller whales and porpoises, the land types held the place of our carnivora and herbivora, while the amphibians exceeded in size our largest crocodiles. All these forms seem to have ended in Cretaceous times. Associated with all these forms were many highly-organized winged insects and upon them the Pterodactyls probably fed. The probable relationship between the insect life of the Mesozoic period and flowering plants has been referred to.

A curious contemporaneous fact of the reptile age is the existence of true mammals. Fossil remains found in the oolite of Oxfordshire and Jurassic formations in Dorsetshire, Somersetshire, Bavaria, and the United States indicate the existence in these times of small mammals resembling the ornithorynchus of Australia. The earliest known fossil bird dates from this period, but though birds undoubtedly did exist at the end of the Mesozoic age, their remains are very rare; we can only assume that those that died were at once devoured by reptiles or fishes.

The records contained in the Cainozoic or following age, even in the earliest formations show a complete disappearance of the Dinosaurs and the huge reptiles of the preceding age, and their replacement by highly-advanced mammals which show indications that they were the ancestors of hoofed animals, of the modern carnivora and the quadrumana. The organization of these mammals is so high that we are forced to think that they represent the end of a series now lost, but which bridged over the gap

between them and the small mammals of the Mesozoic age. Remains of these large and later mammals are fairly abundant in the Eocene formations. These herbivorous creatures had small brains but huge tusks and horns, also five-toed stumpy feet and, in the case of Dinocerata, the animal must have been quite 11 to 12 ft. long and at least 7 ft. high. These strange creatures seem to have been especially plentiful on the borders of the lakes and marshes of Egypt and what is now Colorado. The Eocene and Miocene formations show also the existence in those times of huge carnivora which were evidently ancestral forms of our wolves, leopards, tigers and lions. There are smaller herbivora also which represent our deer and camels, while other genera seem to have been more like our horses, as they show a series of gradations in the feet towards those of the horse tribe. The same formations have yielded relics which give the links in a chain of evidence connecting our modern elephants with the early ungulates. The earliest form from the Egyptian Eocene was about the size of a very large dog with short chin, later the Palæomastodon appears, with a longer chin. After this come the Tetrabelodons from the Miocene beds of France and North America and the Pliocene of Germany. These resemble elephants in general form, though their very elongated lower jaw with incisor teeth suggest a development in another direction. Later stages, as indicated by more recent remains, show a progressive shortening of the chin or lower tusk and a lengthening of the trunk until our modern elephant appears. Remains of these intermediate forms have been found in Britain, Northern Europe and Asia; also in frequent association with stone arrow-heads, which indicates that even in these relatively early times these animals were hunted by primitive man.

To the contemplative student of this subject the fossil remains of no area present greater interest than those of South America and Australia. We know very little of the early history of the latter continent, but stress has been laid already on the fact that the former assumed the present geographical form in comparatively late times. From Brazil to Patagonia the late Cainozoic and early Neozoic formations are peculiarly rich in remains of mammalia. Of these the bats are abundant, while other insectivorous genera are rare. The hoofed animals, which over other early land areas seem to have roamed in herds, are in South America represented not only by all forms now existent there, but by some which are now only found in other continents, as well as by some now quite extinct. Among the former are true horses as well as some peculiar genera

of ancestral forms of horses and llamas. In the Patagonian deposits we find remains of animals of the rhinoceros type and early elephants, also certain rodents and marsupials which respectively anticipate the guinea pig, the cavies, the viscachas and the Australian forms of to-day. Some of these were evidently very large. Judging by the abundance of remains all over South America, the edentates, such as sloths, armadilloes and ant-eaters, must have been numerous. Not a few human implements have been found in close association with these remains. The carnivora have left traces of their existence and so have the monkeys or early primates. In the Australian deposits, all the mammal remains are of marsupials except those of bats and some rat-like rodents.

If the fossil record is imperfect as to animal life in its stages of development, it is even more so in respect of the ancestry of modern man. What evidence there exists is confined to the Pleistocene age, in which occurred one or more ice periods. The evidence is of two kinds, that afforded by human remains and that of implements or other relics suggesting a human origin found in association with them. As to both this direct and indirect evidence, we cannot say it is indisputable. We may refer to this evidence briefly, in the order of its probable original antiquity.

The oldest alleged remains of man is that suggested by a thigh bone and skull found in 1892 at Trinil, in Java. These represent a creature found in the Pliocene formations which, suggesting a type between the simian and human, has been termed *pithecanthropus erectus*. The molar teeth were large with stout and divergent roots, while the thigh indicated the erect attitude and a stature surpassing that of most modern men and carrying a head with heavy brows, a narrow forehead and flattened skull, containing little more than half the brain capacity of an average European. Although this find has not been free from objections as to the interpretations to be placed on it, still the weight of evidence shows a margin for rather than against the view that it represents the most ancient remnant of anything we can call man. In association with these humanoid bones were found those of animals such as hippotamus or rhinoceros. There were no implements and the body had not been interred. The next most ancient evidence of man is a jawbone found in 1907 at Mauer, near Heidelberg. It is massive, but with teeth of somewhat small size. It is difficult to place this jaw exactly; the teeth resemble those of man rather than apes, and the convergence of the two rows behind the canines of each side point in the same direction. It is not impossible that such a jaw might have been in conformity

with the Trinil skull, whose teeth were inadequately small. The fact of a jaw of this form being found so far distant from the Java findings suggests that the human ancestral types had a wide range of distribution. The Mauer jaw was found in Pleistocene deposits in association with remains of bears, rhinoceros and an archaic type of elephant. No implements have been found, nor any suggestion of interment.

The foregoing fossil remains present good claims to be regarded as evidence of creatures intermediate between man and the more highly-developed apes. We next find other fossil bones of undoubted human nature, though in some features they may justify the conception of a distinct species or even genus. Certain teeth discovered at Taubach, in Saxe Weimar, come under this category, also a number of bones found in a cave near Krapina, in Croatia. These bones were found in association with remains of contemporary animals such as an ox, rhinoceros and cave bear; there were also relics of implements. These human remains have been subjected to severe critical examination and the consensus of opinion points to the existence even in those times of two types of early man. Perhaps the two most discussed sets of human remains are the skeleton found in the cave above the River Dussel, in the Neanderthal ravine, and the skull found in a case at La Chapelle, in the Corrèze district of France. Both these finds belong to the same type and represent what is called the Neanderthal man, an undoubted form of early man. Human implements and remains of reindeer have been found in the neighbouring formations where these bones were found. The Chapelle man had evidently also been buried. Other human remains from caves at Le Moustier and La Ferrassie, both in the Dordogne, conform to similar conclusions of the existence of primitive man in the early Pleistocene age. From the associated animal remains and those of implements it is inferred that the Moustierian man lived during one of the glacial periods. Analogous remains of the Neanderthal type of man were found many years ago in the Forbes Quarry at Gibraltar. What are known as the Grimaldi skeletons and found in a rock cave near Mentone differ from the foregoing by presenting certain negroid characters, but the true significance of these is open to dispute. Remains of reindeer, a hyæna and some form of cat were found in the adjacent layers, together with implements corresponding to the Le Moustier man. The remains from Galley Hill, in Kent, from Brux and Brunn, in Moravia, and from Ipswich are all human, but agree in presenting what may be described as mitigated characters of the Neanderthal

man and his allies. That is, they represent a later type, and this is confirmed by the more advanced features of the associated implements found in the same deposits. The same applies to the skeleton found at Combe Capelle, in the Dordogne, and all suggest the view that they represent a transitional type of primitive man intermediate between the early Palæolithic man and those of the modern Hominidæ. The difficulties in the way of saying definitely whether a given bone or group of bones, long buried in the earth, is that of an ape are obviously great. To some extent, recent advance of knowledge regarding man's early implements helps to arrive at a fairly accurate conclusion as to age. These implements are variously termed as being either neo-lithic, magdalenian, mousterian, acheulean, chellean or pre-chellean according to their varying degrees of modernity. The pre-chellean implements are the oldest and found near the Cromer Beds, which mark a very early stage in the Pleistocene period, a period which modern estimates put down as being quite 400,000 years. This means that the date of the very earliest recognized records of humanity lie some half million years behind us. There is much to suggest that they may be even twice as old.

IV.

Such is the evidence regarding the various stages in organic development on the earth and the factors which have influenced it. We may now ask what is its meaning?

The reader cannot fail to have been impressed by the extraordinary complexity and delicacy of the physical forces that have continued to act, with no serious break of continuity, during the vast periods of geological time which, expressed in terms of our notation, has probably been not less than twenty millions of years. These forces have been curiously balanced and apparently brought into action alternately in opposite directions, so as to maintain, over a large area of the earth, land surfaces which never reached a stable condition. The evidence shows the land to have been lowered by denudation, deposition, and subsidence, yet ever being renewed by foldings and crumplings, the outcome of elevatory forces whose nature and degree we can only partially conceive. Yet, throughout, these obscure forces have acted with so much certainty and regularity that the long lines of plant and animal development have never been completely broken. The meaning of this seems to be that had it been otherwise, and the earth's surface reached a condition of permanent stability, then the life on the

earth would have reached its final stage long ago and, deprived of the stimulating effect of environment change, have remained in a condition of prolonged uniformity.

If we think of the evidence concerning plants, we realize that development and evolution, during the periods to which the records extend, have been by no means a regular advance from the simple to the complex. Frequently, the reverse has been the case. The horsetails and club mosses of the present time are much simpler than those of the Palæozoic period, and the cycads are now much less highly organized than their Mesozoic prototypes. The dominant cryptogamic species of the Palæozoic age, that is the gigantic horsetails and club mosses, had lost their importance by Mesozoic times, and the great Palæozoic group of seed ferns was replaced all over the earth by the cycadophytes, while the true ferns would seem to have become more prominent. The cordaiteæ were succeeded by the coniferæ and the maiden-hair trees. When the Cretaceous period came, the cycadophytes dropped away, their place being taken by the angiosperms or flowering plants, apparently an offshoot of their own stock. These were the salient changes in the world's plant development, we know nothing of how the revolutions were effected, or how the infinite variety of flowering plants has developed since Mesozoic times. What the evidence really shows is a succession of dominant groups, each of which reached a high degree of development in its time, and then, as the conditions changed, fell into the background to have its place filled by some new family. The history of the animal world is similar.

Whatever may have been the methods by which these changes came about, we must admit that the dependence of animal life upon vegetation is the essential reason of some of the most prominent features of the early earth as presented by geological evidence. The Palæozoic series of strata comprises a thickness of stratification greater than that of the Mesozoic and Cainozoic strata combined. This thickness is a fairly accurate index as to the relative periods of time covered by them respectively. The seas and oceans of the Palæozoic age were probably as full of life as they are now, though the forms were of a lower type and less varied. On the land, the animal life was scanty, the only vertebrates being a few amphibia and archaic reptiles; with them were numbers of primitive spiders, centipedes, crustacea, and true insects. In the enormous time covered by the Devonian, Carboniferous and Permian formations, to which may be added the evident gap

between the latter and Triassic, or first period of the Mesozoic age, the vegetable kingdom was left to develop freely, and it was only slowly that animal life developed. The long Palæozoic age, with its dense, moist-laden atmosphere, obscuring the direct rays of the sun, together with a probable scarcity of free oxygen and an excess of carbon dioxide, was obviously antagonistic to the free and full development of terrestrial animal life; but it was clearly the precursor and essentially preparatory for the apparently sudden and wonderful outburst of higher organic development which we have seen characterized the next age.

The luxuriant land vegetation of the Palæozoic era, that which formed the great coal fields of the earth, was clearly at first uninfluenced by the scanty animal life; gradually, the attacks of huge plant-devouring reptiles, suited to survive in the heavy carbonated atmosphere, probably led to vegetation starting on new lines of evolution, and becoming more varied and suited to resist their attacks. As the new type of vegetation established itself in the Mesozoic period, so the highly specialized reptiles themselves were unable to obtain sufficient nourishment and gradually died out, giving way to Carnivora, the varied Mammalia and other forms more suited to the new and changed environment. Concurrently came the birds and more specialized insects which had been developing slowly. Slowly, by the interaction of plants and animals, the higher forms of animal life evolved as we find them to have existed in the Mesozoic and Cainozoic ages. The change recorded in these times is certainly startling, but it clearly followed the natural law of adaptation to environment and was essential for the production in later times of the higher mammalia and intellectual man. In furtherance of this object there seem to have been other causes at work, more especially towards the suppression of lower types, whose persistence might have prevented or checked the development of the higher forms destined to succeed them. One of these causes would appear to have been the curiously small brain content, and consequent low intelligent vitality given to or possessed by the huge and varied reptiles and animals of the earlier periods. This naturally favoured their becoming an easy prey to more intellectual types, or succumbing to changes of environment, whose onset and teachings they were unable to appreciate. Another cause has been the action of what Weismann calls "germinal selection." In simple language this is but a competition for nutriment among germinal determinants from which an organ or group of organs is developed. In this competition the stronger

determinants are developed at the expense of the weaker; and if the effect be the growth of parts which are useful, or at least not hurtful to the species, then each generation will see the survival of more and more such vigorous germinal determinants. If the determinants run riot by leading to unbalanced growth, or beyond the point of utility, or at the point of effective hurtfulness, then the result is suppression of the species, or elimination of the individuals which exhibit such unbalanced, useless, or harmful growths. The curious disappearance of weird monsters presenting in varied form extreme development during past epochs may be explained on reasons here outlined; that is, the growth of spiny excrescences, as seen in the graptolites of the Silurian, the horns of the pariasaurians of the Triassic, the armour of the dinosaurs at the end of the Cretaceous, and the cattle or deer of modern times are examples of growth until a climax is reached, when the extreme forms die out.

The complete extinction of many of the largest mammals, so abundant all over the earth in Pleistocene times, is full of suggestive meaning. Except for the glacial epochs, there has been little change of the earth's surface since the end of the Cainozoic era. These climatic catastrophes undoubtedly did produce extensive migration of mammalia, but the ice-sheets were of definite limits, and species survived the ice ages which are extinct now. Another cause of extinction may be the excessive bulk of many early mammals; excess in bulk invariably means slow rates of increment of the species, and also lessened ability to escape from enemies or danger. These causes account for many extinctions, but do not explain the dying out of many mammalia in the Pleistocene age, and under conditions not materially different from those under which they had developed and lived for years. Some other cause has been at work as well, and that cause is man, who, in his struggle for existence or from wantonness, has contributed in the past, and is contributing in the present, to the extinction of many forms of animal life. This brings us to the great thought of all, when and how did man find his place on the earth?

We do not know how man originated with any more certainty than how the horse or elephant came to assume their present forms. Biological and geological facts indicate that they and other species did so originate from forms apparently diverse. From these analogies we are justified in believing that man's origin is traceable by evolutionary processes from corresponding primitive forms. The evidence as to man's early form upon the earth is unfortunately

most imperfect, but what there is indicates a very great antiquity for the later phases. The recent finds as to early implements go far to make up for deficiencies in mere osseous remains. The presence of implements used by primitive man in the weald of Kent, which represents the location of old hills over a thousand feet high now quite washed away, coupled with the existence of remains of primitive anthropoids in the oligocene formations, makes it possible to believe in the existence of man of modern type in the Pliocene period. How modern man has evolved from the anthropoids we cannot even guess. He presents in this day diverse types, and the evolution of these types from a common stock demands the lapse of time carrying us well into the Pliocene. Of the survivals of old human forms, the aboriginal races of Australia are possibly the true living representatives of the earliest man. The controversies associated with the Neanderthal and other similar skeletal remains seem to err in attempting to explain these forms as representing the stage reached by man in the Pleistocene period to which they undoubtedly belong. It is difficult to believe that, between then and now, modern man could have evolved from such a primitive stage. The meaning is rather that not only the Neanderthal man, but the Mauer man and the man of Java, are really survivals of a very ancient type.

No one with any knowledge of comparative anatomy can regard any of the existing anthropoids as a human ancestor, but, recognizing the extraordinary degree of structural similarity, merely hold them to be products of a common stem. When the divergence occurred between the anthropoid and human lines of descent we do not know, but it is permissible to place it as far back as the middle of the Cainozoic age. Many of the lesser difficulties as to man's evolution from primitive types may be solved by the recognition of more than one primordial stock of human ancestors. We know that present-day wheat has evolved from four separate stocks. Similarly, proofs exist as to the multiple nature of equine evolution; what is true of wheat and the horse may be true of man.

In closing this analysis or review of organic development on the earth, one cannot disregard a meaning or conclusion which is justifiable from the evidence. It is that the complex series of physical and chemical adjustments of the earth as a part of the planetary system were absolutely essential to the development of life upon its surface. If we bear in mind, further, the unbroken series of adaptations to environment furnishing the motive power

of organic development, we must see that this earth forms a special sphere among the spheres, and the improbability of a similar organic development, culminating in man, on any other planet. If this idea be correct, and certainly all the evidence regarding organic development on the earth indicates a prevision and definite preparation of the earth for man, the conception follows that man's adequate preparation for a still higher development depends upon the use he makes of the earth. What that higher development in store for man may be we do not know; but, since man is the unique and highest outcome of organic development on the earth, and alone able to understand and make use of the forces and products of Nature, it is permissible to conceive that, in the course of future ages, man's ultimate development will be towards the acquirement of further faculties, possibly in the direction of a psychic sense, and generally towards an approximation to or absorption into the Absolute, or that Being who not only created but co-ordinates the forces of which organic development on the earth is the witness. In postulating such a Being, who evidently has purposively brought about the evolution of a conscious and intellectual entity like man, we may conceive that man is hardly the first result of that purpose. Further, it is permissible to conceive that in the universe there have been and are now infinite grades of consciousness or mind, and of influence of beings upon beings, and even of higher beings upon lower. In other words, the co-ordinated agency and evolution of myriads of such manifestations of energy has been and is the motive power of organic development, and by the progressive evolution of such energy, the higher mentality of man is the product. This metaphysical conception affords at least a clue to the basal cause of matter, force, life, consciousness, and of man himself.

NOTE.—Anyone wishing to pursue this subject further may well read such books as Geikie, "Textbook of Geology," 3 volumes, 1904; also Chamberlin and Salisbury, "Geology and Earth History," 2 volumes, 1909; also Lankester, "Science from an Easy Chair," 1907; also Johnstone, "Life in the Sea," 1908; also Wallace, "The World of Life," 1911; also Duckworth, "Prehistoric Man," 1912.

SPINAL ANALGESIA.

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By spinal analgesia is understood a method in which parts of the body are rendered insensible to pain by the injection of a drug into the spinal canal.

Historical.—Corning, in 1885, first conceived the idea of producing a direct effect upon the spinal cord, by the injection of cocaine into its vicinity. In 1889, Bier independently produced spinal analgesia in six cases by the injection of cocaine. This drug he found unsatisfactory and later, following the discovery of stovaine by Fourneau, in 1904, he made further researches into this method.

Since then, alypin, novocain and tropacocaine have been introduced, and much work has been done in the formulation of a simple technique.

In 1907, Barker published a report on a series of 100 cases, on which he had operated under spinal analgesia, and gave a full account of a new and important factor which he embodied in his technique. This was the employment of a solution of greater density than that of the cerebrospinal fluid; when injected, this solution flowed to the most dependent part, and its action could therefore be limited to a definite part of the cord.

This method Barker and others following him have since used for six years with safety and success, and it will here be fully described.

Anatomy and Physiology.—The spinal cord in the adult extends only to a level with the upper border of the second lumbar vertebra, when it becomes continuous with the filum terminale, which, as a bundle of connective tissue, extends to the termination of the dural sac at the second or third sacral vertebra. In a child the cord ends opposite the body of the third lumbar vertebra.

The dural sac into which the injections are made is a more or less wide lymph space, surrounding the brain and spinal cord.

Through the foramen of Magendie and the foramina lateralia the entire subdural space and its contained cerebrospinal fluid are in communication with the ventricles of the brain. Poisons dissolved in the cerebrospinal fluid may, through these foramina, therefore, gain access to the inner lymph spaces of the brain, and thus be brought in contact with vital nerve centres, especially in the floor of the fourth ventricle.

The dura does not closely invest the spinal cord, a wide space being left between it and the pia. This space is, however, incompletely divided into an anterior and a posterior compartment by the ligamentum denticulatum. In the posterior compartment are the sensory roots, in the anterior the motor roots. This ligament forms practically a partition between the two compartments, for, according to experiments made by Dönitz, coloured solutions (Indian ink) injected into the posterior compartment do not penetrate into the anterior. The posterior compartment is in the cervico-dorsal portion of the spinal cord, subdivided in two halves by the posterior longitudinal ligament.

From the termination of the spinal cord at the second lumbar vertebra, down to the end of the dural sac at the third sacral vertebra, the dural sac is an undivided space in which the nerve roots run to their respective points of exit as a bunch of nerve fibres, the cauda equina, which nearly fills the entire space.

At the lower end of the spinal cord (conus medullaris), and a little below it, the nerve roots are arranged in a right and left bundle, with an intervening open space, from 2 to 5 mm. in width, on a level with the second lumbar vertebra. Lower down the nerve roots are more evenly spread out, filling the whole space, but leaving free room for the cerebrospinal fluid to filter through. In the cauda equina the motor roots are situated in the anterior portion, and the sensory roots in the posterior.

Upon the outer surfaces of the dura, in the epidural space, especially at the sides, are rich venous plexuses and loose adipose tissue.

The distance from the skin to the dural space is, in the lumbar region, generally from 4 to 6 cm., but in men with well-developed muscles it may reach a depth of from 7 to 8 cm., and in fat persons even to 10 cm.

As to the size of the spaces between the arches of the lumbar vertebræ, the third and fourth are, as a rule, larger than the first and second, while the fifth is narrower from above downward, but wider from side to side.

In abnormal cases the spinous processes of the lumbar vertebræ may, however, cover each other in a tile-like manner, rendering the introduction of a needle impossible.

Strong flexion of the lumbar spine increases the depth of the interspace.

The cerebrospinal fluid is nearly as clear as water, very poor in albumin, with a specific gravity of 1·007. The quantity according

to Key and Retzius is normally from 50 to 150 c.c. The pressure in the lumbar region is, in the recumbent position, equal to from 60 to 100 mm. of water. Changes in posture affect to a high degree the position of the cerebrospinal fluid. If a colouring substance in solution be injected in the lumbar region, followed by a high Trendelenburg posture, the colouring matter will appear at the base of the brain.

The importance of this relative mobility of the cerebrospinal fluid is very plain if one considers that the local anæsthetic used in the injection may be diffused through the entire volume of the fluid, aud so carried along the spinal cord to the brain. It is particularly important that the poison should not reach the vital centres in a condition of concentration.

In order to prevent such a diffuse poisoning of the entire cerebrospinal fluid, and to be able to tell precisely which point is being exposed to the effect of the anæsthetic, Barker employs for injection only solutions heavier than the cerebrospinal fluid. If, moreover, by the addition of a suitable substance a different viscosity be given to the solution to be injected, this will with difficulty mix with the cerebrospinal fluid, and just as a bead of mercury easily changes place in a tube filled with fluid and always stays at the most dependent point, so, by changing the posture of the patient, we can always calculate at which particular point the local anæsthetic is being deposited, and by placing the patient in a suitable position we can prevent the poison from reaching the cervical region of the cord *en masse*.

Medicaments.—Cocaine was the anæsthetic first used in spinal analgesia, but from the start it proved so dangerous, and the anæsthesia was attended by so many serious complications, that the search for other agents was soon begun. Leaving out of consideration those agents which have been tried, but have been found to be unsatisfactory or too dangerous, we will now mention only those which are at present in use.

Tropacocaine was discovered in 1891 by Giesel, and was first physiologically tested by Chadburne, of Boston. It is readily soluble in water, making a neutral, non-irritating solution. The solution will withstand sterilization by boiling. It is one-third as poisonous as cocaine, and acts as a vasodilator. The anæsthesia occurs sooner than with cocaine, and lasts longer. It should not be used with suprarenal preparations, as it counteracts their effect. The usual dose is from 0·02 to 0·05 or 0·06 grm.

Stovaine was synthetically produced by Fourneau in 1904, and

was first used in spinal anæsthesia by Chaput. It is readily soluble in water, of a feebly acid reaction, and possesses noteworthy antiseptic properties. The solution may be sterilized by boiling. It has a vasodilator action and is somewhat irritating to the tissues. The usual dose is from 0·02 to 0·05 or 0·06 grm.

Novocain was produced synthetically by Einhorn and Uhlfelder in 1905. It is readily soluble in water making a neutral solution. It may be heated to 120° C. without decomposition. The dose of novocain is double that of stovaine, while its effect is neither so deep nor so lasting.

In spinal analgesia, besides using the least dangerous anæsthetic, it is also of importance to employ the anæsthetic in such a form as will do the least amount of injury to the tissues. In this respect the tonicity of the injected fluid in the spinal canal is not such an important factor as it is in the case of injections used to produce local anæsthesia.

The relation of the various agents, however, in regard to this particular question, is apparent from a table by Barker giving the specific gravity and the freezing point of the respective substances :—

	Specific gravity	Freezing point
Novocain, 5 per cent solution ..	1·0090 ..	0·555
Tropacocaine, 5 per cent solution ..	1·0106 ..	0·545
Stovaine, 5 per cent solution ..	1·0064 ..	0·585
Cerebrospinal fluid	1·0070 ..	—

The addition of a suprarenal preparation to the anæsthetic solution is not to be recommended.

In local anæsthesia the suprarenal preparations are of great value, inasmuch as they prevent the rapid absorption of the injected substance and thus allow the drug to act more powerfully upon the infiltrated area.

In spinal analgesia the conditions are quite different. Here the anæsthetic solution is deposited in a large lymph space and to "incarcerate" the drug by the addition of a vasoconstrictor is out of the question. Our choice of drugs then lies between tropacocaine and stovaine.

My own experience leads me to the conclusion that there is little or no difference to be found in their effect.

The depth and duration of the analgesia produced by similar doses of either drug are practically the same; while complications, such as headache or nausea, are not more frequent after the use of the one or the other.

There are only three ways by which an analgesic solution

injected through the second lumbar interspace can make its direct effects felt in the mid-dorsal region, or even higher, as is sometimes the case in this procedure. These are either (1) by slow diffusion; (2) by a shifting upwards of the whole column of cerebrospinal fluid in which it is suspended; (3) by gravitation, if the injected compound is heavier than the liquor spinalis.

Within the spinal canal, which we are precluded from injecting above the second lumbar interspace, it is desirable in many cases to affect the nerve roots or cord as high as the mid-dorsal region.

This can be accomplished in one of the ways indicated below.

(1) Diffusion of one fluid in another, this is a slow process and is unlikely to be the mode by which the injected fluid is spread in this procedure.

(2) Bier and his followers have aimed at shifting the injected compound upwards or downwards with the whole mass of the liquor spinalis by raising or depressing the pelvis. That the spinal fluid does recede towards the head on elevation of the pelvis is undoubted, but it is difficult to imagine that it recedes to such an extent as to carry with it a mass of fluid lighter than itself the distance from the second lumbar to the fifth dorsal vertebra, some 8 or 10 in.

It is probable that with such a fluid as he has used, the specific gravity of which is 1·0058, suspended in the liquor spinalis, with a specific gravity of 1·007, what was achieved by elevation of the pelvis was rather a more rapid diffusion of the injected fluid, due to the consequent oscillation of the liquor spinalis. This rapid diffusion would, of course, dilute the injection, and might carry it higher than was desirable.

(3) There remains, then, the third possibility, namely, the action of gravity.

This force may affect an injected fluid of greater density than the liquor spinalis, and carry it through the latter to the most dependent part of the canal.

It is easy to observe the behaviour of one fluid injected slowly into another, if the fluid be coloured with an aniline dye. If both have the same temperature and specific gravity, the injected fluid forms at first a distinct coloured cloud, which slowly diffuses through the mass into which it enters if the latter is in a state of rest.

On the other hand, if the injected fluid has the same temperature, but a greater specific gravity, it sinks rapidly in a definite stream to the bottom of the second fluid, and remains there as a

distinct stratum without diffusion for a period proportionate to its density and viscosity. A consideration of these points shows that if we aim at localizing a spinal injection to any particular region of the cord we can utilize the force of gravity acting upon an injected compound of greater density than the cerebrospinal fluid. Thus the heavier injection sinks to the lowest part of the canal, independently of any displacement of the liquor spinalis. Here it remains, more or less undiluted, in contact with the surrounding structures.

A 5 per cent solution of tropacocaine has a specific gravity of 1·0106, which is considerably higher than the specific gravity of the cerebrospinal fluid, 1·007. This probably accounts for the undoubted success which has attended the use of this compound.

A 5 per cent solution of stovaine in distilled water has a specific gravity of 1·0064, and a freezing point of 0·0585° C. This solution is lighter than the cerebrospinal fluid, and will not gravitate, but will slowly diffuse at the place of injection.

We cannot, therefore, expect to obtain exactly uniform results if we employ solutions of widely different densities. A failure to appreciate this may largely account for the irregularities which have been reported in the action of these drugs.

To raise the specific gravity of the stovaine solution, Barker has added 5 per cent of glucose to the injected fluid, so that a solution containing 5 per cent stovaine plus 5 per cent glucose, and distilled water 90 per cent, has a specific gravity of 1·0230.

This solution is heavier than the cerebrospinal fluid, and will, on injection, gravitate to the lowest portion of the spinal canal. The glucose has no irritating effect when thus injected, and beyond rendering the solution slightly viscid, and thus helping localization, its addition has little or no action on the contents of the canal.

With such a solution of comparatively high density and viscid character, diffusion and consequently dilution of the stovaine is limited. Thus, a smaller dose can produce a full effect, and the drug, by means of gravity, can be so localized as to exert its specific action at the desired level of the cord.

Clinical.—For use in spinal analgesia the "Record" syringe of 2 c.c. capacity is the best. The needle has a close fitting stylet, and the point is oblique and hollow so as to secure sharpness without too much lengthening of the terminal opening. As the operator is dealing with very small amounts of injection fluid, and the loss of two or three drops would make a considerable difference to the extent of the analgesia, a means has been devised by Barker to

ensure the delivery of all the injection compound through the point of the needle. This consists of a second cannula slender enough to fit the first hollow needle loosely, and long enough to project beyond its point about 1 mm. when pushed home. This cannula is attached to the syringe, which is filled with the solution through it.

Our next consideration is how to pierce the lumbar dural sac with the point of a needle, and through it inject our analgesic solution below the level of the spinal cord.

The configuration of the bones below the fourth lumbar spine makes a needle puncture here a matter of great difficulty, so that our choice of a spot for puncture is restricted to the second or third interspaces of the lumbar vertebræ. Here the sac can be reached between the lamina or the needle can be thrust exactly in the middle line between the second and third, or third and fourth spines.

It is now generally acknowledged that puncture in the middle line is the easiest and safest method. Here the puncture is least painful, and there is less risk of wounding any nerve structure or vessel if the needle is kept true to the middle line and only just penetrates the dural sac completely.

At either side there is a possibility of touching the strands of the cauda equina. Besides this, any small amount of fluid injected in the middle line can spread freely through the liquor spinalis, whereas, if delivered among the nerves of the cauda equina on either side, it may be entangled there, and tend to pass upwards or downwards in their interstices on that side only, and so fail to reach the general cavity of the spinal sac. This may produce an effect too low for the contemplated operation or a one-sided analgesia.

The middle line, therefore, is the preferable site for the entrance of the hollow needle. Here the analgesic compound passes freely into the spinal fluid, and can move unhindered upwards or downwards from the point of entry.

A convenient guide to the site of injection is the fourth lumbar spine which is on a level with the highest points of the iliac crests: a line joining these two points across the back will indicate this spine. The hollow needle is thrust through the skin just above this point or just above the third spine and its point aimed straight forward and a little upward. If this is accurately done, no difficulty as a rule is experienced in reaching the middle of the dural sac.

In some very stout people, the spine may be difficult to feel with the finger, and the point of the needle may strike bone; its upward

slant is then changed, and the needle point thrust in a lower direction.

This usually suffices to pass the spine without the necessity of a fresh skin puncture if the back has been well rounded, in order to obtain the greatest amount of separation between the lumbar spines. With a little practice lumbar puncture becomes quite easy, though in early attempts some difficulty may be encountered. Whether during the puncture the patient should sit on the edge of the table, with the back rounded to its maximum, or lie on his side with the knees well drawn up, depends on the site of the operation and the height of the required anæsthesia.

Spinal puncture is certainly easier in the first position. To illustrate the procedure, let us take a case requiring operation for appendicitis. Here we must aim at obtaining analgesia up to the ensiform cartilage, which means that the analgesic solution must be brought into contact with the nerve-roots as high as the sixth dorsal vertebra.

The needle, cannula and syringe are boiled for ten minutes in plain water to ensure their sterility. When cool, the cannula is fitted to the nozzle of the syringe.

An ampoule containing the sterile stovaine-glucose solution is now taken and the end is broken off. The cannula is introduced through the broken end and the fluid is drawn up into the syringe. Bubbles are dislodged and all fluid except the required dose is expelled and the syringe laid aside on a sterilized towel.

The patient has meanwhile been placed on the operating table and his confidence established by a few words.

The skin over his lumbar region having been previously cleansed as carefully as the area for operation the position of the patient on the table now demands the operator's most careful attention. For an operation on the right side of the body, he is placed lying on that side so that the nerves to that region may be most deeply affected.

His head and neck are raised on pillows and to ensure that the analgesic solution reaches the sixth dorsal segment, the buttocks are raised by a padded one-inch board placed under his right trochanter. This raises his pelvis about one inch or sufficiently high to cause the sixth dorsal vertebra to be the most dependent part of his spinal column.

Great care must be taken that the head and neck are sufficiently raised to prevent the injected fluid from running higher. His knees are then flexed on his abdomen, and his back is rounded as much

as possible in the lumbar region. The skin is now finally cleansed and a sterile towel is laid across the pelvis, through which the iliac crests are felt and the fourth lumbar spine determined.

The skin on either side of the selected interspace, second or third lumbar, is then steadied by two fingers, and the needle with

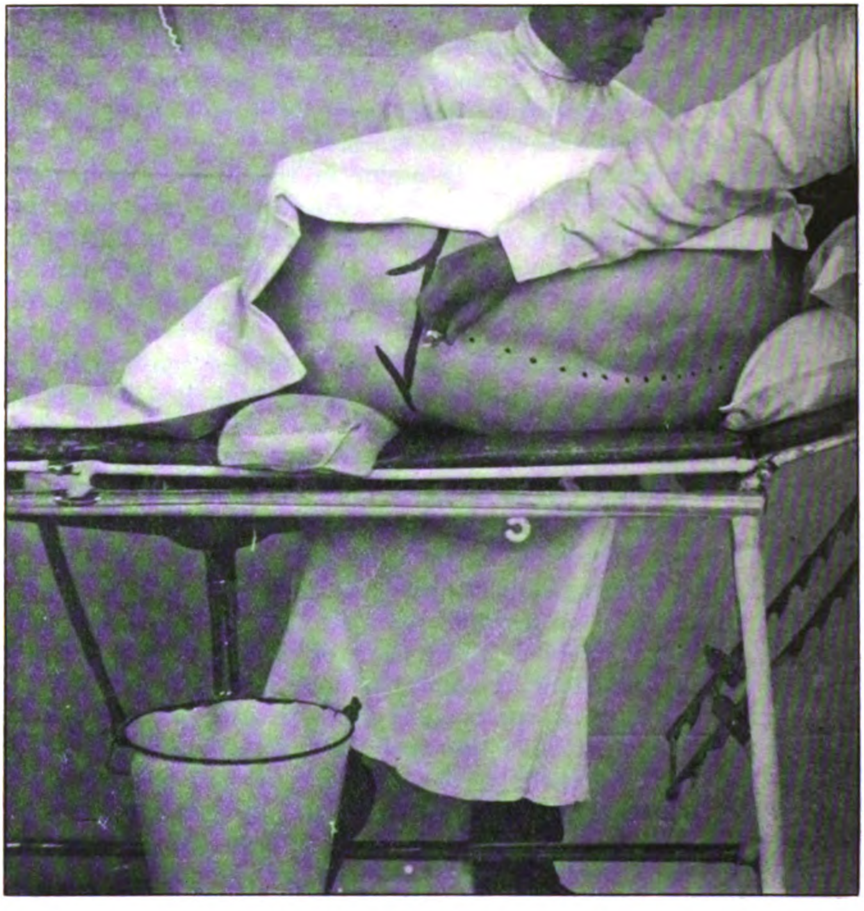

FIG. 1.—Position of patient before injection for an operation on appendicitis. The 7th dorsal spine is at the lowest point of the curve. The needle and syringe are in the position for puncture.

stylet in position is sharply thrust through the integument in the middle line to a depth of 1 in. The stylet may now be withdrawn. The needle is then pushed firmly through the interspinous ligaments until the dural sac is punctured, when the spinal fluid flows

out in rapid drops, or more rarely in a continuous stream. This flow of cerebrospinal fluid is most important, as it is our only guarantee that the sac has been reached by the needle. If the drops come slowly, the needle-point may not be completely within the sac ; it should then be rotated on its long axis when a faster flow usually issues from the stem. In no case should the analgesic solution be injected until the flow of spinal fluid is satisfactory.

When 2 or 3 c.c. of liquor spinalis have escaped into a measure-glass, the slender cannula attached to the loaded syringe is inserted through the hollow needle and pushed gently home; the measured solution is then injected into the sac by a slow thrust of the piston. The needle, cannula and syringe are now rapidly withdrawn together and the puncture is covered with sterile plaster.

Throughout this procedure the patient is lying on his right side, and the position is still maintained for two or three minutes. By this time the solution has gravitated to the most dependent part of the spinal canal and produced its analgesic effect on the side on which he is lying.

The height of the analgesia is now noted, and if satisfactory, the patient is gently rolled on to his back, when the left side of his body quickly becomes analgesic. The board elevating his pelvis may now be removed.

As a rule, two minutes elapse after the injection, before the patient feels a numbness in his feet, then the perineum becomes analgesic, and later, the trunk as high as the nerve supply reached by the injection.

A screen should now be placed in front of the patient, as it is seldom desirable that he should see the manipulations of the operator, and if possible an assistant or nurse should converse with him and so distract his attention from the matter in hand.

At the conclusion of the operation, the patient should be gently lifted into bed with his head and shoulders raised.

For an operation on the perineum a simpler process is available. Here the analgesia is not required at a high level, so no elevation of the pelvis is necessary. After completion of the usual preparations, the patient is placed in a sitting posture across the end of the operating table. His feet rest on a chair, and he is directed to place his elbows on his knees and his head in his hands and so to round his back that the greatest separation is obtained between the lumbar spines. The fourth lumbar spine is defined and the needle thrust into the skin immediately above it. When the lumbar sac is reached the injection is carried out as described, and the patient

is then gently moved into the lithotomy position with his head and shoulders well raised. In two or three minutes the anus becomes insensitive and its sphincters completely relaxed, when the operator can proceed to work.

A notable point in this procedure is the complete muscular

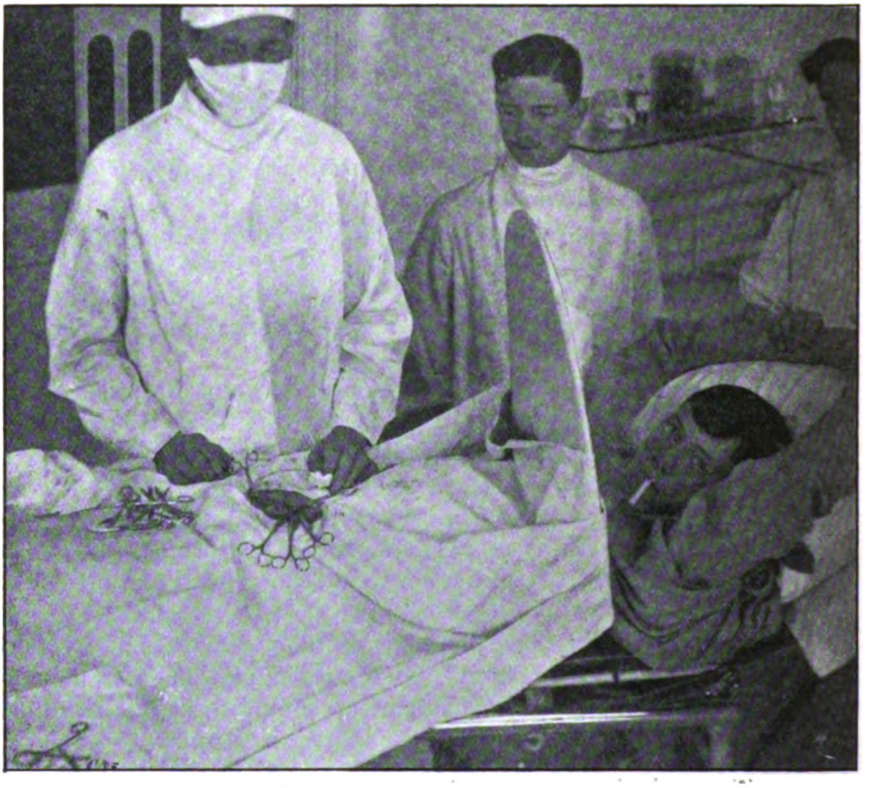

Fig. 2.—An operation for left inguinal hernia.
The elevation of the patient's head and the position of the screen are shown.

relaxation which is obtained both after the use of the tropacocaine and stovaine.

This is especially remarkable during anal and abdominal operations. The muscles are found flaccid and toneless and there is an entire absence of that straining which so frequently hampers a surgeon in cases where a general anæsthetic is employed.

The most constant phenomena following an injection of this

solution are first a loss of the knee, plantar, and cremasteric reflexes. Subjective sensations of numbness and tingling in the feet. Analgesia of the perineum, feet, legs, scrotum, and penis, gradually reaching the abdomen. Sensation of pain is lost before that of heat and cold, while tactile sensation is the last to disappear and the first to return as the effect of the drug passes off.

During the operation, most usually about fifteen minutes after injection, the patient sometimes becomes pale and sweats, he may be nauseated and vomit, but as a rule this passes off in five minutes. The pulse-rate is usually slowed, and the blood-pressure lowered.

Respiratory distress, as evidenced by "air-hunger" and inability to cough, is sometimes seen. This is dependent on intercostal paresis from high analgesia, but it does not affect all patients to the same degree, the element of nervous apprehension being more marked in some than in others.

On the return of sensation the patient often complains of a headache, which is seldom persistent or severe, and generally yields to a dose of bromide. Vomiting occasionally occurs but is not prolonged. The temperature is nearly always raised to 100° F. for forty-eight hours, when it returns to normal.

Later sequelæ have been reported, such as paralysis of the ocular muscles and paraplegia, but one cannot avoid the conclusion that these were due to a faulty technique.

The stovaine-glucose solution, which has now been in use for six years, can be obtained in glass ampoules, each of which contains about 2 c.c. of a 5 per cent solution of stovaine and glucose.

The filled ampoules are carefully sterilized by boiling at 110° C. before being finally sealed. The amount of this solution necessary for injection in any one case should not exceed 1·2 c.c. or 6 cg. of stovaine. One cubic centimetre of this solution containing 5 cg. of stovaine, usually produces an analgesia up to the level of the umbilicus, lasting from fifty to sixty-five minutes.

We may now briefly consider the dangers of this method and its range of applicability. The amount of danger during the actual narcosis appears to be in direct ratio to the height of the analgesia. So long as the diaphragm is able to perform its function, danger to life is trifling. This is now well recognized, yet the production of analgesia above the nipple line is often attended by a feeling of faintness and air-hunger in the patient due to paralysis of the intercostal muscles. Though not dangerous, this is unpleasant and can be avoided. Headache on the evening following the operation is fairly frequent. It usually disappears after a dose of phenacetin or bromide.

Cases of paralysis of the ocular muscles have been reported on the Continent, but in several thousand cases where Barker's technique, as above described, has been employed, it has only once been noticed, and then was of a temporary character.

The range of applicability may now be considered, and although successful operations on the head have been reported by Jonnesco with a stovaine-strychnine injection, these were not unattended by accidents.

Operations, however, such as the radical cure of hernia, appendectomy, and operations on the bladder and rectum are particularly suitable for spinal analgesia. In fact I use spinal analgesia as a routine method for all operations below the level of the umbilicus. This means that the injection fluid must reach the sixth dorsal segment.

I have used this method also for gastro-enterostomy and operations on the kidneys, and for the removal of pieces of rib, but I do not attempt to produce analgesia in any region supplied by nerves above the fourth dorsal segment.

Having lately completed a series of 400 operations under spinal analgesia at the Cambridge Hospital, Aldershot, in all of which the injection was quite satisfactory, and in none of which was there any cause for anxiety as to the patient's condition, I can only conclude by recommending the method to those engaged in surgical work, as it is most useful in the Army.

THE TRAINING AND WORKING OF AN INDIAN SANITARY SECTION.[1]

By Major R. TILBURY BROWN.
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Having recently had an opportunity to train and work an Indian Sanitary Section in Burmah, the following article is an account of my experiences. The details may be of use to others under similar circumstances.

The unit known as an Indian Sanitary Section is of recent formation (I.A.O. No. 708 of 1910). Many of the details given hereafter were experimental, and the suggestions made are to some extent tentative, though perhaps worthy of note for improvement in the light of further experience. The composition of an Indian Sanitary Section is laid down in "War Establishments, India," p. 250, as follows:—

Detail	Personnel					Horses
	British		Indian	Followers		
	Officer	N.C.Os. and men	N.C.Os. and men	Public	Private	
Medical Officer	1	..	..	..	2	1
British N.C.Os. and men ..	..	10	..	..	1	
Indian N.C.Os. and men ..	..	..	14			
Sweepers	..	..	..	60 (*a*)		
Bildars	..	..	..	10		
Bhistis	..	..	..	5		
Total	1	10	14	75	3	1

Remarks.—(*a*) For work at a base as many more sweepers could be added as might be found necessary.

In the Burmah division, we have three Indian Sanitary Sections, namely, Nos. 42, 43 and 44.

It is convenient to consider the following experiences under the two periods of "after nomination" and "after mobilization."

After Nomination.

The Lieutenant-General Commanding, through the P.M.O. (A.M.O.), ordered O.Cs. of selected units to nominate the required numbers of N.C.Os. and men (I.A.O. 708/10).

[1] Received for publication, May 8, 1912.

When making up the personnel of sections there are a few precautions necessary. In the first place, see that none of the regimental sanitary detachment is included, as, if this is done, the detachment may have to be depleted at a moment when it is most required, namely, on mobilization. Secondly, see that the N.C.Os., British and Indian, are men of intelligence. Thirdly, make up the sections so as to contain different castes, as for instance, two Brahmins or Kshattriyas, five Gurkhas or Punjabi Mahommedans or Madrasis, and five Hindus. The brahmin in the section should be the senior N.C.O. and be recommended by his O.C. as a reliable man. If good, he will be found invaluable. N.C.Os. and men of Gurkha regiments are particularly useful. Fourthly, with the aid of the civil authorities, try to obtain a few sweepers locally, so as to tide over the time required to obtain them from India.

Training.—After nomination, the section attended a special training at Divisional Headquarters under the Divisional Sanitary Officer. The training consisted of a three weeks course for the British and the same for Indian N.C.Os. and men. The following is a short synopsis of the course for the Indian portion :—

Monday	Morning ..	Presence of vegetable seeds in air, water, earth. Some cause disease (disease seeds). Passage of disease seeds to man.
	Afternoon ..	Demonstrate: Latrines and urinals, receptacles and carts in barracks.
Tuesday	Morning ..	Care of blankets. Disease seeds: how they leave the sick and how they enter the healthy in cholera, dysentery, enteric, plague. Importance of pure air.
	Afternoon ..	Demonstrate: Barrack room cleanliness, ventilation, &c.
Wednesday	Morning ..	Water: Care and collection in barracks, water bottle. On Service—(*a*) Wells, (*b*) Springs.
	Afternoon ..	Demonstrate: Morning's lecture.
Friday	Morning ..	Water (continued): (*c*) Streams, (*d*) Rivers. Purification: (*a*) clarification, (*b*) filtration.
	Afternoon ..	Demonstrate: Morning's lecture.
Saturday	Morning ..	Water (continued): (*e*) Boiling; water boiling station: pumping station. Storage of water.
	Afternoon ..	Demonstrate: Morning's lecture.
Monday	Morning ..	Flies and disease. Latrines in barracks, care of. Shallow trench latrines. Gumlah latrines (and incinerator).
	Afternoon ..	Demonstrate: Shallow trench latrine, (*a*) men, (*b*) officers.
Tuesday	Morning ..	Incinerators.
	Afternoon ..	Demonstrate: Morning's lecture.
Wednesday	Morning ..	Urinals, day and night.
	Afternoon ..	Demonstrate: Morning's lecture.

Friday	Morning ..	Cook-house washing places, (*a*) men, (*b*) officers.
	Afternoon ..	Demonstrate: Morning's lecture.
Saturday	Morning ..	Camp refuse. Ablution places. Bazaar.
	Afternoon ..	Demonstrate: Rubbish receptacle and incinerator. Ablution place.
Monday	Morning ..	Disinfection.
	Afternoon ..	Demonstration and Lecture: Road Posts.
Tuesday	Morning ..	Sanitary area.
	Afternoon ..	Demonstrate: Road post and sanitary area.
Wednesday	Morning ..	Malaria.
	Afternoon ..	Demonstrate: Work of malaria squad.
Friday	Morning ..	Plague and cholera.
	Afternoon ..	Demonstrate: Rail post, (*a*) Short halt, (*b*) rest camp.
Saturday	Morning ..	Composition and duties of Sanitary Section. Difference between Sanitary Section and Regimental Sanitary Detachment.
	Afternoon ..	Recapitulate: Road and rail post.
Monday ..	.. ..	*Viva voce* examination.
Tuesday and Wednesday	.. ..	Practical examination.

A short pamphlet in Urdu was prepared, and appeared to be greatly appreciated.

The course for the British N.C.Os. and men was a combination of the foregoing with that suggested by Major R. J. Blackham, R.A.M.C. (JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, January, 1910).

At the end of each course there was an examination. The successful candidates received the St. John Ambulance Association certificate and those who obtained 75 per cent received also a certificate on I.A.F. X. 1843.

The examination for Indians consisted of (*a*) an oral of five minutes, and (*b*) a practical. The practical examination was conducted as follows: The class was divided into squads of about one N.C.O. and ten men. Necessary tools and equipment such as picks, shovels, bill hooks, coloured cloths, buckets, pakhals, I.G. tubs, empty barrels, &c., were brought down to the examination ground which was near a stream. The N.C.O. of each squad was given a paper on which the allotted task was written in English and Urdu. He was allowed to take the tools, &c., which he wanted from the store and was given from 9 a.m. on Tuesday to 4 p.m. on Wednesday in which to complete the task. A tent was taken down to the ground with the stores, and one N.C.O. and four men from a unit assisted as store-keepers and slept in the tent at night.

The following are two examples of the tasks :—

(1) You are the N.C.O. in charge of a sanitary squad. The boundaries of the rest camp are given you. The only water is the stream. One Indian Regiment, 500 strong, and fifty Mounted Infantry will arrive to-morrow at 4 p.m. and will march out next morning. Make all the necessary arrangements for the water supply. (*Note.*—the water in the stream was bad and required boiling). Make the necessary latrines and incinerators.

(2) You are the N.C.O. in charge of a sanitary squad. The boundaries of a camp are given you. One Indian Regiment will arrive to-morrow at 4 p.m. and will stay for one week. The water in the stream is supposed to be good for drinking purposes. Make all the necessary sanitary arrangements.

The examination of the British portion of the section consisted of an oral for two minutes, a paper and a practical. The following is an example of a paper: Time, three hours. Only four questions may be answered. Two must be from Part I, and two must be from Part II.

PART I.

Question 1.—The immediate burial of excreta by the man from whom they pass is most important. Explain this and give your reasons.

Question 2.—A case of enteric fever has occurred in a tent. How would you disinfect the tent and the man's clothing?

Question 3.—What arrangements would you make for a camp bazaar?

PART II.

Question 1.—A camp is at X, between a large river and a road. You are the N.C.O. in charge of the sanitary squad. What arrangements will you make for the water supply?

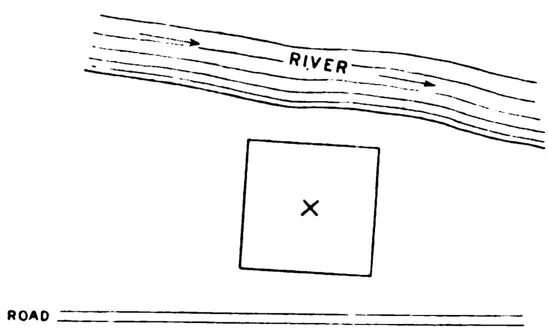


FIG. 1.

Question 2.—X is a temporary platform at a rail halt post. S is a stream of bad water. W is a good well. A British Infantry regiment and ten horses arrive to-morrow at 11. a.m. and stop one hour for food. You are the N.C.O. in charge of the sanitary squad. What arrangements will you make?

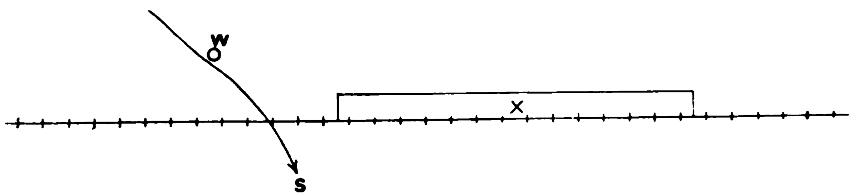


FIG. 2.

Question 3.—XX are camping grounds for two British and two Indian Regiments. They will be occupied for at least one month. You are the N.C.O. in charge of the sanitary section. What arrangements would you make for latrines and incinerators?

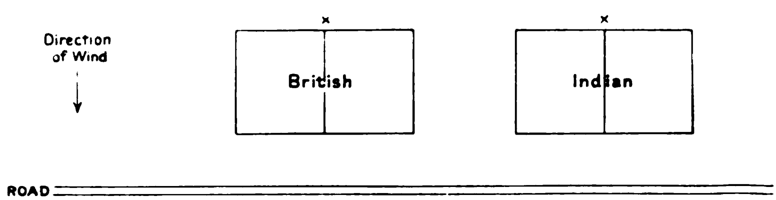


FIG. 3.

The practical work was conducted as follows: A Unit supplied the required number of untrained men so that each candidate had three to four men to assist him. Picks, shovels, &c., were available. Each candidate was given a task and allowed three hours to complete it. The following are two examples of tasks:—

(1) Make a water-boiling station and provide drinking-water for ten men. (*Note.*—The water required alum clarification and boiling.)

(2) Make a latrine and urinal for ten British Officers.

After the training the men returned to their respective units. It is suggested that their knowledge should be kept up by employment with the regimental sanitary detachment in the following manner. A unit ordinarily employs one N.C.O. and eight men in

its sanitary detachment. Say it has eight men on the roster as divisional sanitary section men. We could keep up the training of the latter by employing six men of the regimental sanitary detachment and two men of the sanitary section for two months, then change the latter for two other men of the sanitary section and two of the former for the two unemployed men, and so on every two months.

AFTER MOBILIZATION.

Manœuvres took place in March, and the Lieutenant-General Commanding ordered a Sanitary Section to be mobilized. The force consisted of about 2,500 men (without followers), but as only Indian units (except a few mounted infantry) were taking part, expense being a great consideration, and as an Indian infantry battalion had recently arrived in the division, the following personnel was detailed :—

2 N.C.Os. British. These were the N.C.Os. in charge of two of the divisional sanitary sections.

1 N.C.O. and	7 men	from 1 Indian unit			From two of the divisional sanitary sections.
1 ,,	5 ,,	,,	,,	,,	
1 ,,	6 ,,	,,	,,	,,	(the new arrival) for training.

Total = 5 N.C.O.'s and 18 men.

The menial establishment was represented by two sweepers and one bhisti. One Army hospital corps ward servant accompanied the sanitary officer to assist in the field laboratory.

I accompanied the section as its Commanding Officer in order to note the difficulties for future guidance.

As regards the above composition. The number of N.C.Os. and men were ample for all the work required, but the menial establishment was insufficient, even though there were no extra road or rail posts to be maintained and the camp was not vacated and reoccupied by various units. Although in a camp on the Lines of Communication most of the actual menial work is performed by the followers of the units, unless there is some large sanitary scheme such as a central incinerator or a refuse removal system, there still remains some work for the men of the menial establishment of a Sanitary Section or Squad. In a fairly large camp (Sanitary Post) as this was, it was found that one bhisti and five sweepers were required.

Scheme of Work.—A preliminary scheme of work was prepared by the divisional sanitary officer and passed to the P.M.O. for his approval and subsequent submission to the Director, General Staff. The scheme read as follows :—

The object of the sanitary section will be to perform duties which would be required under active service conditions.

There will be no road or rail posts such as would exist under service conditions, and therefore the section will proceed with the advance party and will not leave squads behind to open up sanitary posts.

It is proposed to divide the mobilization training into three stages :—

(1) Preliminary to the march.

(2) On the march to the camp.

(3) In camp.

(1) *Preliminary to the March.*—The sanitary section will mobilize a week before the march and undergo a short revisionary course.

Special attention will be paid to :—

(*a*) Laying out arrangements for a camp.

(*b*) Selection of water supplies for various purposes.

(*c*) Purification of water.

(2) *On the March.*—Probably very little can be done in the way of construction, and therefore the training will be mostly with a view to accustoming N.C.Os. to decide quickly as to the sanitary measures which they would adopt if they were left in charge of a squad at a sanitary post.

It is proposed to work on the following lines :—

(*a*) At the end of the first half hour's march, each day, suitable ground for latrine trenches will be selected and several small sets (three) of trenches dug 500 paces apart. These will be marked by yellow flags and directing posts.

Commanding officers of units in the main column will be requested to make their men abstain as much as possible from falling out until the column reaches this place. When on the march, some of the sweepers will accompany each unit and carry spades. On arrival at the halting place one of the regimental sanitary detachments and the sweepers will go to the nearest trenches. The detachment will supervise the sweepers and the trenches will be filled in on resuming the march.

It is hoped that the above method, which is experimental, will to some extent solve the great difficulty of preventing the usual fouling along a line of march.

(*Note.*—This was found to be of little practical use as the main column fought its way up. It might have been useful if they had marched up in the ordinary way.)

(*b*) At the end of a march the bivouac will be pitched, the available water supplies will be searched for and the general position of latrines selected. The regimental sanitary detachment of the advance party will be assisted by the sanitary section if required.

Non-commissioned officers will write such orders as they consider necessary, and as they would give to their squad on opening up the place as a sanitary post.

Directing posts will be made and erected, so that the main column will have no difficulty in locating water supplies, &c.

Any necessary orders, as, for instance, that certain waters are unfit for drinking purposes, that latrines must be dug in certain situations, &c., will be communicated to the main column.

(3) *In Camp.*—The camp will be treated as far as possible as a sanitary post on the lines of communication. As the menial establishment will be practically *nil* the service conditions will be modified.

As far as possible the sanitary arrangements will be prepared for the arrival of the main column. On arrival the regimental sanitary detachment will take over the sanitation of their areas.

Any general or large sanitary measure, such for instance as incineration of excreta at a central station, or boiling water centrally, which the regimental sanitary detachment find difficult to carry out will be done by the sanitary section.

The bazaar and milk supply will be under the supervision of the sanitary section.

A certain number of the sanitary section will act as sanitary police and the whole camp will be inspected daily.

The sanitary section will be exercised in the formation of sanitary posts, the sanitation of routes, the formation of large water boiling stations, incinerating stations, &c.

The above programme was carefully carried out. During the preliminary training lectures and demonstrations were given, stores and equipment were taken over, and loading and unloading the carts practised, flags were made, millboard cut up to form directing posts, a N.C.O. was taught the use of the stencils, latrine marking ropes were made, and rapid making of bivouacs was practised.

Transport and Equipment.—The transport and equipment was obtained under "Mobilization Regulations, India," para. 22.

The following list was found sufficient (the original has been slightly modified according to subsequently noted requirements):—

3 tents, Indian troops	Sent by train	Brought by sanitary section personnel from their units.
1 tent, British N.C.O.'s		From a unit at headquarters.
1 tent, followers		Not taken; they lived with followers of the unit with whom the sanitary section camped.
20 shovels 10 picks 8 billhooks		Obtained from store left behind by a regiment on leaving headquarters and not yet relieved.
10 camp kettles and covers 4 tarpaulins, 18 ft. by 12 ft. 2 pakhals 5 buckets, G.I. 2 camp lanterns, fragile, and broke on line of march 24 carriage candles		From supply and transport department
2 tins kerosine oil Saw Hammer Nails, 1 lb. large ,, 3 lb. small 3 yards cloth, red 3 ,, ,, white 3 ,, ,, blue 4 ,, ,, yellow 2 balls string 10 armlets, "M.P.," made in bazaar Stencil letters, made in bazaar Stencil directing arrow, made in bazaar Stencil ink and brush 50 tin discs, circular, stamped 1 to 50, from bazaar Cordage and rope		On payment.
3 incinerators, Samways Water analysis case Alum, pot. permang., cresol Water-purifying tablets Microscope, stains, slides, &c. Distilled water, alcohol, &c. Packing case suitable for table 12 large sheets millboard		From the divisional laboratory
3 mule carts.		From mule corps, for the above and men's kit, food, &c.

One of the British N.C.O.'s was a lance-corporal, and on application to Director, General Staff, was given acting rank of serjeant whilst on manœuvres.

On the March.—On the march the section accompanied the advance party and assisted them in repairing the road for the main column.

The Officer Commanding the section made notes as to the condition of the road, water supplies, halting places, cultivation, villages, stores procurable, &c., for the information of the senior medical officer of the main column, and for passing to the administrative medical officer. Example:—

Omathe to Nawngkio, February 12. Gently undulating ground.

Cross railway between mile 62½ and 62¾, line keeps along east of road till 61½ where it crosses again. Between 62¼ and 62½ is a good halting and entraining place, but no water could be seen.

No water along route till 57¾ where there is a small stream of good water. Between 56½ and 57 there is a good stream coming from marshy ground E of road.

Country is low jungle till about mile 57½ when it gets more open, and there are large patches of open country covered with long grass.

Cultivation, practically *nil*.

Road.—Generally good, but with one or two badly rutted pieces up to mile 60; between 60 and 67¾ the road is rocky and bad in places. Available for wheeled transport.

Nawngkio.—Population about 500. Bazaar every fifth day, rice and vegetables (including potatoes) available. Only about 40 pints of milk could be obtained. Civil dispensary. Diseases: very little venereal, no cholera, enteric or plague. During rains, malaria and dysentery. In winter, bronchitis and chest complaints and a little diarrhœa. Soda-water factory in good order. Station ¼ mile from village and dâk bungalow. Water, good stream south-south-west of dâk bungalow. Stream only fit for bathing west of dâk bungalow. Impounded spring of doubtful quality north-north-east of bungalow and north of main road.

The advance party was kept hard at work all along the line of march preparing the road, so that at the end of a march there was very little time in which to select good camping sites, but as these had not previously been demarcated by a General Staff Officer and by a Sanitary Officer, the Officer Commanding the section selected the best, made arrangements for water supplies, &c., and drew a rough sketch for the Officer Commanding the main column, of which the following is an example:—

Wetwun, February 10. *Camping-ground*.—(1) Under trees north-east of dâk bungalow; (2) mules and ponies on dry rice fields north-east of (1); (3) available ground in low jungle south and south-east of (1).

Drinking-water.—(A) Good at A from spring near bridge over large stream. Two bamboos giving together 190 gall. per hour. Sentry required to prevent drawing from the stream, which is not fit for drinking purposes.

(B) Excellent at B from small pipe in hillside, spring supply, pipe to be plugged when not in use, only 68 gall. per hour, about 400 yd. north-west of bungalow.

(C) Fit, from two bamboos about 400 yd. west of dâk bungalow; large supply, not measured (about 500 gall. per hour).

(D) Fair, three bamboos (surface water) about 200 yd. south-west of bungalow, plentiful supply, over 800 gall. per hour.

Mules Drinking.—Good pool, hard bottom, 30 yd. down-stream from bridge at A. E is a road to pool from rice-fields across a streamlet a few yards north of path. This will allow mules not to interfere with traffic along path. Sentry required to direct.

Bathing.—(1) Best at pool by bridge at A. If used, bathing should be suspended for say one hour while mules water below. Stream is strong and will soon clear. Stream below mule's pool is difficult to approach and pools are deep.

(2) Some washing can be done at D.

(3) A little washing can be done at C.

Latrine Trenches.—Trenches in vicinity of above camps cannot pollute any of the above drinking-water supplies.

(*Note.*—Here followed a lettered plan which has been omitted from this paper.)

In Camp.—On arrival at the camp, which we treated as a sanitary post, the sites of the camps and sanitary areas were marked out and the drinking-water supply was policed.

Latrines and urinaries were prepared for the main column, but there was not sufficient time to make washing-up places, incinerators, &c.

Directing boards, in English, Urdu and Nagri, were put up to show the way to the various water supplies.

A latrine was made at the railway station and directing boards to it, as well as to a drinking-water well, were erected.

The following arrangements were made for a *camp bazaar:* In consultation with the Assistant Provost Marshal, who was a Native magistrate from the capital of the State, and the head man of the village, a plan of a stall was decided upon and a contractor found who would erect stalls at a small cost. The following were the Bazaar orders :—

Site.—Stalls in one single line, 25 ft. from road at nearest point, and 25 ft. from fence behind.

Stalls.—(1) Must be in line: (2) must be separated by 6 ft. between each double stall or single stall; (3) must be 1½ ft. off the ground, lower part not enclosed and nothing beneath it; (4) may be erected at holder's expense; (5) can be erected by contract at 12 rupees per double stall, or 8 rupees per single stall, according to plan.

Prices.—Rates to be fixed by the provost-marshal, a board with the rates in three languages to be placed above each stall. Rates not to exceed those of the village bazaar.

Latrines.—One for males and one for females.

Sweeper.—One at 15 rupees per month, to be kept by bazaar stall-holders, and every stall-holder to contribute. The sweeper will be responsible for the cleanliness of the bazaar and its latrine, and for the working of the incinerator.

Refuse Receptacles.—One large basket to be kept 20 ft. in front of every third double stall, and off the ground.

Milk.—Sample to be brought for inspection by the sanitary officer daily. All milk must be boiled. The milk man must have a separate stall.

Butchers.—Slaughter places will be allocated. Slaughtering will be done over a trench and the soiled trench will be covered with earth. The beef stall will be well away from the bazaar and well fenced in so that no meat can be seen from outside. The mutton stall may be in the bazaar. A bucket of water will be ready every morning at each shop on the visit of the sanitary police, who will bring cresol. All woodwork which can be soiled and all utensils will be washed with cresol solution. Cattle pens will be defined, they must be away from the bazaar and must be kept clean by butchers.

Vegetables and Fruit.—Badly bruised or over-ripe fruit to be destroyed in the incinerator. Unripe fruit not to be sold.

Mineral Water Factory.—Only water from the camp drinking supply to be used. Holder is responsible for condition of the absorption pit.

Sanitary Police (*S.P.*).—One to parade the bazaar from réveillé to tattoo and supervise cleanliness, &c.

Badges.—Every person wishing to hold a stall will report in person, and bring any assistants, to the sanitary officer. His name and class of goods will be entered in a register and badges will be given. No person except a soldier or a follower will be allowed in the bazaar unless wearing the badge stamped with his number.

The arrangements for the drinking water supply were complicated and need not be further referred to here. A N.C.O. of the section (Brahmin) was placed permanently in charge.

The site for an "infectious disease camp" was demarcated, and the health of the neighbouring villages ascertained.

On arrival of the main column, the work of the section became mostly supervisory, except a small working party that visited

isolated places and held themselves ready for work at a moment's notice.

Standing orders were issued by the Officer Commanding the section.

A daily order book was kept and orders for the next day were given to the serjeant for the day in the evening after the camp orders had been issued.

Standing Orders: The *Orderly Serjeant for the day* will only leave camp when inspecting, and must see that the Orderly Corporal is in camp during his absence. He will visit the camp bazaar every morning to supervise the sanitary police and see that cresol is used by butchers, he will satisfy himself that stalls are clean and the food is good, that the latrines are in good order and the incinerator working. He will inspect the whole of the camp north or south of main road once during his tour of duty. He will be responsible that the daily orders are issued. He will report himself with the orderly corporal at 7 p.m. daily at the tent of the Officer Commanding the section.

The *Orderly Corporal for the day* will only leave camp when inspecting and must see that the Orderly Serjeant is present before he leaves. He will inspect the bazaar and the whole camp north or south of main road once during his tour of duty. (*Note:* It was so arranged that every N.C.O. and most of the men in the section performed the above duties.)

The *N.C.O. in charge of the water supply* will visit the drinking water supply at réveillé and tattoo, and be present there from 6 to 9 a.m. and from 4 to 6 p.m. He will supervise the picket and regulate the traffic. He will immediately report to the Orderly Serjeant any shortage in the flow of water.

The *Water Picket*. A man to be on duty from réveillé to tattoo; the tanks to be filled between 12 and 2 p.m. whilst the reservoir is filling, when only the tanks are to be used. He will regulate the traffic and prevent people entering the enclosure.

A man to wear an armlet and police the boundaries of the enclosure, also to see that the wire and fences are in repair and mend them if necessary. He must also see that the notice boards are in position, must not allow cattle or men to enter the enclosure.

Camp Police.—All camp policemen will wear badges. A man will be on duty for allotted areas and their surroundings. He will bring any defect to notice of the N.C.O. of the regimental sanitary department concerned or to the working squad of the section for

the day. The man at the bazaar is responsible for the cleanliness and work of the bazaar sweeper.

Working Squad.—A N.C.O., four men and one sweeper will be told off daily. They will remain in camp, except when visiting allotted places, and will be prepared with picks and shovels for duty in any part of the camp.

Sweeper.—One sweeper to report himself daily to the R.A. sanitary N.C.O. at 7 a.m. and 5 p.m. to work for one hour at the incinerator.

The following is an example of daily orders.

Daily Orders.—March 6.

Orderly Sergeant for the day, Sergeant A.

Orderly Corporal for the day, Naik J. S.

Naik S. B. D. is in charge of water supply.

Two men of the sanitary section will act as picket.

One man of the sanitary section will assist the picket at the pump.

Sergeant A. inspects north of road, Naik J. S. inspects south of road.

Sergeant T. and Naik A. to go to small village one mile north of camp on east of railway. Select a site and make sanitary arrangements as follows: Sergeant T., 50 M.I. (British) and 1 Batt. B.I.; Naik A. 50 M.I. (Indian) and 1 Batt. Indian Infantry.

Sanitary Police, 1 Infantry camp and bazaar; 1 M.I., R.A., S. and T., Police.

Lance Naik R.B.S. and the working squad will visit the camp of L.G.C., Commandant and Director, and the station.

One bhisti to get water for L.G.C.'s. camp.

One sweeper to R.A. incinerator.

Whilst in camp the N.C.O's. and some of the men were frequently given tasks similar to the example above.

The force went out 7 to 10 miles one day to fight and bivouac for the night. Advantage was taken of this to train the section in the preparation of drinking water supplies. The section (except a few left behind for necessary work), with their equipment and rations, marched out two days before the force. At the site selected for the khaki camp there was abundance of water which was unfit for drinking purposes. On careful search the sites of three springs were found; these were opened out, cleared, and arrangements were made to facilitate the drawing of water; an ample supply was obtained. At the Red camp there was a good spring flowing

out of a rock, a dam was made and bamboo spouts put in so that the water could easily be drawn. The section made its own camp and that of the L.G.C. on his arrival. Flags were placed at the various water supplies. Directing notices were put up from the road to the supplies, and sentries were posted by the section at the drinking springs.

A practical point was noticed. When opening, enlarging or clearing a spring-head, it is important to allow a free overflow. The sides can be built up until no overflow takes place, and can then be cut down at one point till there is a good outflow. If the depth is not then sufficient, this can be obtained by digging and enlarging the pool downwards. If no overflow is permitted, the spring will often fail to give its former output, and may even stop altogether. It is thought that this may be due to increasing the pressure so much that the water in the spring finds another outlet, which gradually increases in size until the latter channel becomes an easier outlet than the former.

Whilst in camp the section had its little camp area in the lines of one of the units. It consisted of one tent for the Officer Commanding section, three tents for the section and stores, and a laboratory tent, which also formed the office. The followers lived with those of the unit, and the section was placed on the unit's ration indent.

On breaking up the camp the section saw that it had been properly cleared and all the pits filled in. They then marched back to headquarters with the column and handed in the stores and equipment, and returned to their respective units.

This year the special sanitation class at headquarters will be mainly for the regimental sanitary detachments, but will be attended by men of the sanitary sections who have replaced casualties since last year, and who have not been through a class. Next year the class will be mainly for sanitary sections and similarly will be attended by regimental sanitary detachments.

In conclusion, I must say a word in praise of the section. We could not have a British personnel with the exception of the two serjeants. The men were of four or five different castes, but the way they worked together, the keenness which they displayed and the excellent work they did was worthy of the highest praise. They showed an intelligence and reliability which was unexpected, and with a little encouragement they should form a most valuable asset to our sanitary organization for active service.

RATIONS ON ACTIVE SERVICE.

By G. FAHEY.
Late 88th Connaught Rangers.

THE rations of the British soldier of the present day, compared with those of the past, have, both in peace and war, been greatly improved. The authorities, recognizing the fact that diet plays a considerable part in the attainment of physical efficiency, have concerned themselves so much in the matter, that a special department has been created to watch over the feeding arrangements of the Army.

Previous to the South African War very little attention was bestowed on the feeding of the soldier in the field, but that campaign saw a new era in field rations, the eternal canned meat and preserved vegetables being replaced in part by cooked rations of meat and vegetables, together with additional rations of jam, cheese, bacon, and other luxuries.

The most successful of the new rations was jam. Its popularity and dietetic value was proved beyond question. The fault, if it may be so called, of the jam ration, was its liberality. It was so plentiful in standing camps, blockhouses, and small posts, where a daily issue was the rule, that the men tired of it, so that much was wasted or disposed of surreptitiously. On the march, when issued on alternate days only, it was much appreciated.

The rations of meat and vegetables, which became known as the Maconochie rations, were another initial success. I well remember the chorus of praise bestowed on these rations on our first acquaintance with them. It was during the Spion Kop operations, when the weather being excessively warm, and preserved meat not very appetitizing, the first issue of Maconochie came as a boon to the troops. The after-effects, however, were not so gratifying. The contents of many of the tins were very rich and fatty, so that they made the men sick, especially when eaten cold, or warmed in their mess-tins. Afterwards, when opportunities for cooking could be had, the contents were emptied into the canteen, water added and then boiled; in this way the richness was toned down. A meat and vegetable ration, intended for campaigning in a warm country, would be better with much of the fat removed before canning.

The most suitable and convenient ration that came my way,

was issued to us near Pretoria, soon after its occupation. It was a cooked ration of meat, vegetables, beans, and peas; the whole forming a jelly inside the tin. The latter was shaped like a sardine tin, the most convenient form for carrying in the haversack. It was a very tasty and nourishing ration when eaten cold with biscuit, reminding one of the flavour of a good pork pie. A great number of the tins, however, were bad and had to be destroyed. This may have been due to their having been kept in an unsuitable store for too long a period: I believe they were part of some stores left behind by the Boers. This ration was so much appreciated at the time, that I kept one of the labels, which I have by me to this day.

It would be well to have all cooked rations made into a jelly, suitable for eating either warm or cold. The ingredients should consist of beans, peas, rice and meat. Potatoes are not very palatable when packed with meat, nor are they so nourishing as beans.

Canned meat must still remain the staple ration for the field, or for storing in fortresses, owing to its reliability when stored in any climate, and suitability for packing. Cooked rations might, however, be issued more frequently, either separately, or in conjunction with preserved meat.

It was sometimes the custom in South Africa to issue the full rations of preserved meat to the men in the morning before starting the day's march; as the meat was usually packed in 9 lb. tins, the whole day's ration had either to be eaten for breakfast or thrown away, as it was difficult to find a man willing to burden himself with an extra 9 lb. If it was cut up and carried in the haversack, it became uneatable after exposure to the heat of the sun. If small tins are not available, part should be issued for breakfast, and the remainder for the evening meal. Preserved meat tins, when possible, should only be opened in the early morning or evening, and eaten at once. The meat is not so palatable during the heat of the day.

Bacon, as an additional ration, was a welcome change when bread was available. With biscuit it is not so nice, especially the raw variety, which had to be fried. The cooked bacon was better with biscuit, though hardly suitable for a warm country. In a cold climate, owing to its fatness, it would be a most suitable ration.

Cheese was an extra which might have been used more liberally. It is most suitable for eating with the service biscuit, and so much was it appreciated that when it came, which was very

seldom in my experience, I never saw any of it wasted; in fact it was the most popular extra.

Meat extract, a most portable as well as stimulating article of diet, might be made useful as a service ration. I recently had an opportunity of testing some "Special Campaigning Bovril," packed in small tins, sufficient to make about four pints of nourishing liquid. It is more compact and firmer than the ordinary Bovril, and is intended either for use as a sandwich, or to make a hot drink. Spread on the service biscuit, it should make a meal in itself when no fires are available.

A commodity which might be given a trial is chocolate. The soldier of the present day has a partiality for sweet things. As the Army is becoming more temperate, and drinking less alcoholic liquors, sweetmeats are coming more into favour. I have noticed this peculiarity amongst abstaining soldiers, they usually have a liking for cakes, puddings and sweets, and eat less of their meat ration, which fact makes me think that chocolate would be popular on service. The sustaining qualities of chocolate are well known. It is used a great deal by cyclists, chocolate and biscuit being often the only thing eaten on a long spin. I have heard many cyclists speak in favour of its sustaining properties.

I bought some chocolate from the field force canteen near Fourteen Streams, before we commenced operating against the Boer position there. I carried this in my haversack, using it with biscuit whilst it lasted, in lieu of the canned meat. I found it most sustaining, and on the long circular march around the Western Transvaal, most of it on reduced hard rations, which ensued after the position at Fourteen Streams had been taken, I often wished for some chocolate to eat with my biscuit. Being a portable article, chocolate might be carried on marches of this description, where transport is limited and no fresh meat available, to be issued occasionally in lieu of part of the meat ration.

Dried preserved fruits, of which there are so many different varieties nowadays, would make an excellent ration, and one likely to counteract the ill effects of a too rigid diet of preserved meat without vegetables.

The old style of compressed preserved vegetables might be entirely abolished, or be varied by haricot or butter beans, for use either with fresh or preserved meat. Beans are easily packed, the only hindrance to their use perhaps being the fact that they require soaking in water before boiling. This would not be much trouble in standing camps, though on the march it may not always

be convenient. If plentiful enough, beans might take the place of potatoes, which, unless obtained locally, are never good when packed or stored any length of time. Anyone who has smelled the odour from a barrel in which potatoes have been stored will confirm my statement.

Of liquids, tea is the prime favourite of the soldier in the field; coffee is not much appreciated. It was usual in many small posts and blockhouses, to make the tea allowance do for breakfast and tea and to allow the coffee ration to accumulate. Tea was always taken in preference to coffee, when there was any choice in the matter. Cocoa was not to my knowledge used, nor do I think its use would be popular. The soldier on service, without beer or other luxuries, requires something stimulating, even though it may not be nourishing, and tea answers the purpose well.

At no time have I seen tea more appreciated than at the mid-day halt on the march, when it was possible to make it. It was the custom in my regiment when there was a long mid-day halt for out-spanning oxen for the Colonel to order the cooks to make tea. This was very popular with the men, especially when on hard rations. Tea was usually made again on completion of the day's march, except when fresh meat was available, in which case dinner was prepared.

Breakfast might consist of tea or coffee, biscuit, and either cheese, cooked bacon, canned meat or jam. For the mid-day meal, tea, biscuit and any one of the rations mentioned, provided the same had not been issued for breakfast. The evening meal might consist of a cooked meat and vegetable ration, or fresh meat when available. New rations such as chocolate, or dried fruits, might be tried with the mid-day meal, and hot meat extract might take the place of tea occasionally.

In writing this article I have been mainly concerned with rations suitable for the march, having in mind the difficulties and limitation of transport. In standing camps, where fresh bread and meat are available, the ration difficulty is not very great, it sometimes errs on the side of too great a liberality, as it did in my own experience during the South African War, when in many cases much of the extras provided were wasted.

I have heard something of experimental marches being made by small bodies of men, with a view to determining the most suitable rations for marching on. The conclusions arrived at after one of of these experimental marches are not, in my opinion, likely to be of much permanent value; the men know beforehand the reason

of the march, that it is to prove the efficacy or otherwise of a certain scale and variety of rations. Their minds naturally become concentrated on this fact, and are prejudiced either for or against the ration being tested. They will most likely take the former view, and do their best to prove that the rations are perfect, so that despite measurements and weights taken at various stages of the march, which might appear favourable, I do not think that on the whole the knowledge gained by such experiments justifies a standard of marching rations being based on these results.

I remember once making an experiment myself to ascertain whether excessive washing of the feet when on the march was good or otherwise. Being an advocate of washing I was at the same time somewhat troubled in mind by statements made by certain men, that though they never washed their feet or changed their socks, yet they never had sore feet on the march. I resolved, therefore, to make an experiment. The next march I went on I carefully washed one foot daily, frequently changing the sock, whilst I neither washed nor changed the sock of the other foot at all. I was confident that the clean foot would win. In fact it was my ardent wish that it should do so, and prove my theory. Alas, however, for my hopes! The clean foot developed blisters and scalding, whilst the other remained free from either. Fearing that the result if known might be generally acted on, and in the interest of cleanliness, and out of regard for the olfactory organs of my comrades and myself, I carefully kept the knowledge of the result to myself.

So much for experiments on a small scale!

A far better guide than experimental marches is the experience of past campaigns, and more particularly the South African, owing to the duration of the campaign, and the great variety of rations issued during its course. If I were asked personally to name the ration that stood the test of that campaign the best I would have no hesitation in stating that it was the old and much abused "Bully" or canned beef. I consider it the safest and most compact form of meat ration for campaigning in any climate. Despite the sensational exposures some years back anent the canned meat trade, it is surprising how few cases of food poisoning are due to canned beef when compared with other potted or prepared foods. In my experience, and I have seen vast quantities of it consumed during my twenty-two years' service, I have never known any ill results to follow its use. I have advocated the use of cooked meat and vegetable rations as a change from canned meat, but I would not

be in favour of substituting them entirely for canned meat. My aim would be to lessen the quantity of meat to be consumed by the addition of other rations, e.g., cheese, dried fruits, chocolate, &c.

Canned meat, unlike other meat rations, seldom varies. It is usually of the same quality. The same cannot be said of some of the other rations issued during the war, which varied so much, both in quality and alleged quantity. This was particularly noticeable in the jam ration. The great bulk of the jam was of most excellent quality, the 1 lb. tins also being packed full. There were many cases, however, in which the jam besides being of poor quality, only partly filled the tins.

I noticed in the case of jam as well as marmalade, that firms which have gained a name for themselves for these preparations kept up their reputation by supplying the finest jams and marmalade.

It was those firms which do not make a speciality of either that supplied the inferior stuff. One firm in particular which has made for itself a reputation for bacon, supplied jam of a very poor quality, in the manufacture of which much glucose had evidently been used, for it was of such thick consistency that it could not be spread on either biscuit or bread.

The worst jam was that supplied by the Colonies, with one exception—that supplied by Natal. This was the nearest approach to the best English jams.

I remember a Canadian jam, in a tin embellished with a most striking label representing the setting sun and the British Empire—I have one of the labels by me, which I sent home as a Christmas card—it bore the motto "What we have, we hold," which, by the way, was not the alleged quantity; the tins were but three-parts full. The jam itself tasted like blackberries picked in rainy weather and was of the poorest quality.

In jams, or other special rations, firms of old standing and repute for certain specialities, are most to be relied on to serve the best article. I noted this with the Christmas puddings supplied from various funds to the troops. The puddings supplied by our greatest catering firm, though they must have been packed some considerable time, arrived as fresh and wholesome as if they had been but recently made, and were of the best quality. Others were very poor indeed, and suggestive of anything but Christmas.

United Services Medical Society.

PRESIDENTIAL ADDRESS.

By Fleet-Surgeon A. P. BASSETT-SMITH, C.B., R.N.

The Society has reached its sixth year, it has grown considerably in size, and has now two local branches, one at Malta, and one recently started in Portsmouth, giving those members who are unable to come to London opportunities of taking an active part in the work of the Society. It has been the custom to choose a President annually, the choice being made alternately among the members belonging to the different services. This naturally tends to unite the medical officers of the offensive and defensive forces, giving them a common interest in the discussion of any new measure that may be suggested for the preservation of the health of the men under their charge, or for the best preparation to be made for the dire calamity of war.

By the kindness of the Commandant of this College, our Society has held all its meetings here. In his last year's presidential address, Major Waggett, a distinguished member of the Territorial Force, emphasized the debt of gratitude we owe to the Royal Army Medical Corps. Millbank has a great name for scientific research and for practical work, and may well be looked upon as the Alma Mater of many of England's most distinguished sons. Speaking for the Naval Medical Service, we too appreciate the privilege of meeting here, and having the opportunity given us of close intercourse with our brother officers of the Royal Army Medical Corps.

More than two years ago your distinguished teacher, Sir William Leishman, who is always ready to further scientific work, assisted in planning the laboratories of a new Naval Medical School. It was to be founded at Greenwich and together we visited the historic building. This school is now open and is run on similar though smaller lines to your older college. We hope during the session to have the pleasure of entertaining you at this our new Naval Medical School.

It may be of interest to you to think for a few minutes about the evolution and growth of the Naval Medical Service. As far back as the reign of Henry VIII, medical men formed a part of

His Majesty's Navy. In 1626 we read, "there were rumours of war, so the Company of Barber Surgeons was ordered to provide sixteen of the best surgeons for His Majesty's fleet." At this time they were pressed into the Service, as is shown by the following extract taken from a letter to the Admiralty from the Navy Office. It reads, "The fleet now ready for sea, we have according to an ancient custom given orders to the master and wardens of the Barber Company of Surgeons, to press surgeons for all the ships of the first fleet, and have given them charge to cause them to appear before us at the meeting house in Mincing Lane." This letter is dated 1635. In the reign of Charles I we hear that there were neither stores nor drugs, that the hammocks of the men were infected, and that dirt prevailed. Evidently some effort was made to improve matters, as we find in this reign that there was a rise in pay, each surgeon and surgeon's mate receiving 30s. instead of 19s. 4d. per month.

Under the Commonwealth there was a great improvement in the Service and the sick and wounded were well treated. At this time hospital ships were used by the Navy, and there is a report of a letter written by the Secretary of the Commissioners to the Lords of the Treasury, asking for Greenwich to be turned into a hospital for the sailors and marines. This was written in 1692. In the same year the pressing for surgeons ceased, and the Company of Barber Surgeons appointed the Naval Medical Officers.

Ten years later the Apothecaries Company was ordered to provide medicines for His Majesty's fleet.

Up to the year 1704 surgeons were rated with common men, but in that year they were given a warrant, ranking them with pilots, boatswains, gunners, and carpenters. Even then they were considered inferior, and were only allowed to mess with the warrant officers as a favour. One reads a good description of their life in Smollett's "Roderick Random." Over a century later, in 1808, surgeons attained ward-room rank. The senior surgeon then had a cabin, and messed in the ward-room, but the assistant surgeon had to be content with a hammock and gun-room fare. This was a great grievance, as their average age was about 30. It was very humiliating to have to mix with the midshipmen, being hunted like boys, living, sleeping and walking with them.

Up to this time the medical officer in a ship wore an ordinary frock coat and tall hat—now, however, he was given a uniform. This was quite a progressive movement.

A little later, in 1827, we find the first medical instruction

given to Naval surgeons at Haslar Hospital. One of the very early pioneers of our Service was Sir James Lind. He was the Senior Physician of Haslar Hospital, and received a salary of £300 a year. He was honoured both in England and on the Continent, and is looked upon as the father of Naval medicine. Another famous man was Sir Gilbert Blane, whose memory is perpetuated by the gold medal given annually. Sir William Burnett was very distinguished, he became the Director-General of the Naval Medical Service with Dr. Scott, he founded the museum at Haslar, and also instituted a course of lectures for the officers of the fleet. Dr. Scott was the first lecturer at Haslar, his class consisting of twenty-two medical officers drawn from the hospital and from the ships in the harbour. There are some rather amusing directions recorded concerning the behaviour of the audience. They are termed "respectable individuals," and they are asked "to observe the strictest decorum, and not to presume to offer any remarks either aloud, or by whispering, these practices being calculated to distract the attention of the lecturer and the studious."

Under Sir William Packington in 1858 surgeons in ships were given better cabins and better mess accommodation, the pay being raised as well. The ranks then were Inspector-General, Deputy-Inspector-General, Staff Surgeon, Surgeon, and Assistant Surgeon.

In 1873 the title of Assistant Surgeon was abolished, and two years later that of Fleet Surgeon was instituted.

In 1910 the cumbersome title of Inspector-General and Deputy Inspector-General of Hospitals and Fleets gave way to those of Surgeon-General and Deputy Surgeon-General, the old term of Physician having dropped out altogether.

Within the last half century the position of the Naval Medical Officer has vastly improved, and in the general evolution towards progress the Naval Medical Service has been surely and steadily advancing.

There is no time now to speak of the very modern improvements for the treatment of the sick and wounded. We are proud to belong to so great a Service, and feel certain that whether in the stress of battle or among the ravages of disease, the Naval Medical Officer of to-day will uphold with credit the bright traditions that have made the Navy as a whole so glorious in the past.

THE EVACUATION OF THE SICK AND WOUNDED IN THE TERRITORIAL FORCE.

BY CAPTAIN C. R. SYLVESTER BRADLEY,
Royal Army Medical Corps.

INTRODUCTION.

THE paper which I have the honour to read before you this evening is, I fear, a very dull one, and I have found it necessary to quote freely from official publications. I think, however, you will agree that it is an important subject, and I hope that the discussion will prove of value to all of us.

The disposal of the sick and wounded after any large engagement between modern armies presents many difficulties, and requires a very high standard of efficiency of medical services. Even regular troops will often find themselves taxed to their utmost to provide means for the speedy evacuation of their sick and wounded to the base. Any scheme, therefore, for carrying out this service in the Territorial Force must be approached with a full knowledge of the difficulties that are likely to occur, not one of the least being the absence of any official publication dealing clearly with this subject as applied to the Territorial Force.

PART I.

COMPARISON OF THE MEDICAL SERVICES OF A DIVISION OF REGULAR AND TERRITORIAL TROOPS.

The existing Territorial medical services of a division have been modelled on those of the Expeditionary Force of the Regular Army, there being, however, some slight difference between the peace and war strength of these units. In "Peace Establishments" each Territorial battalion has two medical officers, whilst in war establishments there is only one; there should therefore be some slight surplus of medical officers to fill up casualties that occur, but inasmuch as a large number of battalions are without any medical officers at all at the present time, these supernumerary medical officers could not be relied upon, and, moreover, it has been laid down that a medical officer gazetted to a particular regiment can only be detailed to another regiment provided he volunteers to do so.

With regard to the field ambulances, their peace and war establishments are practically identical, and from personal experi-

ence I can testify to their efficiency; being trained on a war footing they have greater facilities than the regular R.A.M.C. for learning the routine duties they would have to perform on mobilization. They lack, however, any practical training in nursing.

The only other medical unit existing in the Territorial Force is the general hospital, and as such it is only the nucleus of a hospital, its strength as shown in peace establishments being: Two officers and forty-four other ranks; and in war establishments: Twenty officers and 109 other ranks.

The eighteen officers not shown in peace establishments are those who belong, *à la suite*, to a general hospital, and are available on mobilization; but it is stated that sixty-six privates will be furnished under arrangements to be made by county associations.

Regulations for General Hospitals of the Territorial Force, 1912, Section 4, says:—

"On mobilization the Assistant Director of Medical Services will arrange with county associations for enlisting into the Royal Army Medical Corps, Territorial Force, the rank and file of the remaining personnel to complete the authorized establishment of a general hospital."

In Appendix II. of the same regulations it states that "County associations might invite county directors to approach voluntary aid detachments with a view to registering names of male members willing to enlist on mobilization of the Territorial Force, in Territorial general hospitals, and county directors should keep a list of the names and addresses of persons who have agreed to enlist, reporting to the War Office before March 31 in each year."

I have quoted these paragraphs simply to show that the provision of these sixty-six men really rests with the voluntary aid detachments. This is a very heavy burden to put on the voluntary aid organization, which at the present time has few men's detachments. It would appear to be wiser to have the peace establishment of the general hospitals increased to war strength.

The following units which exist in the Regular Army are not present in the Territorial Force in any form:—

(*a*) Clearing hospitals.
(*b*) Stationary hospitals.
(*c*) Ambulance trains.
(*d*) Convalescent depots.
(*e*) Medical store depots.

It is therefore left solely to voluntary aid to supply the deficiency.

PART II.

VOLUNTARY AID.

Voluntary aid has been found necessary in all large continental armies to supplement their existing medical services, and, although for the most part their organizations are more complete, our own scheme has a sound working basis.

It is not intended in this paper to give any detailed description of how voluntary aid is organized in this country. The official publication entitled "A Scheme for the Organization of Voluntary Aid in England and Wales," and the handbooks published by the different County Directors, and by the British Red Cross Society, put the whole matter very clearly and concisely. It will be sufficient to remark that the organization of voluntary aid primarily rests with the War Office, and is then delegated through the British Red Cross Society to county associations, then through county branches of the British Red Cross Society to county directors, who administer the whole of the voluntary aid detachments in their county in peace time.

On mobilization it is stated in Regulations for Voluntary Aid Detachments that:—

"A retired officer (not liable to recall) of any regular arm of the Service, but preferably a retired medical officer, should be nominated by the General Officer Commanding each Territorial Division, his name being notified to the War Office. The duties of this officer would be to superintend, under the Army Medical authorities on the lines of communication, the arrangement for evacuation of sick as far as voluntary aid detachments are concerned."

Circular Memorandum, No. 388, dated War Office, London, March 15, 1912, states:—

"(1) The normal functions of members of the detachments will be the care of the sick and wounded within the immediate neighbourhood of their homes, and, as they will while so employed live in their own homes, it is not contemplated that they should receive anything in the nature of pay and allowances.

"(2) A certain number of organizations (e.g., hospitals and ambulance trains) which have no existence in the time of peace will, however, be formed in the event of active operations, and the personnel of these units may be drawn from the voluntary aid detachments among other sources.

"The members of detachments who volunteer and are accepted

for such specific duty will temporarily become part of the Royal Army Medical Corps organization, and will be required to assume the duties and obligations of that service for the time being, including a liability for service outside their own locality.

"(3) Members of the voluntary aid detachments so selected for service outside their own locality will be given a military grading in accordance with their qualifications and the requirements of the service, and will then receive the emoluments attached to the grading in question for the duration of their employment."

These instructions are good as far as they go, but to make the scheme effectual very wide volunteering will be necessary.

Rapid movement to meet a raid will probably be the main function in the early stages of the employment of the Territorial Force, and to permit of this a division must be self contained; with scanty and haphazard volunteering in voluntary aid detachments, it may very likely be impossible to secure a complete clearing hospital or stationary hospital for a division.

Also the terms "neighbourhood" and "locality" require definition. Practically it will mean within 2 or 3 miles of home, otherwise rationing and transport of personnel will be necessary.

I would here state that the county system on which voluntary aid is at present organized does not facilitate the raising of divisional units, such as clearing hospitals. For instance, in the Wessex Division there are six counties, and if a clearing hospital had to be formed for the division it might necessitate correspondence with six different county directors before enough volunteers could be found to complete the necessary personnel.

I think for this reason only it would be better if voluntary aid were organized on a divisional basis.

The Clearing Hospital of the Territorial Force.

No. 3 of the "British Red Cross Society's Training Manuals," Chapter XIX, is devoted to "Ambulance Organization in the Field," and inasmuch as this publication is stated to be issued with the approval of the War Office one might reasonably expect to find at least the outlines of some workable scheme for the evacuation of the wounded. This, however, is not the case. Clearing hospitals are mentioned, but no information is given as to how they are formed.

The impression with which one is left is that a Voluntary Aid Detachment walks up to a dressing station, takes over the sick,

and the dressing station goes on, this being the "alpha" and "omega" of the evacuation of the sick and wounded.

Having thus to some extent prepared the way, it is possible to consider the formation and rôle of the units which carry out the evacuation of the sick and wounded in a Territorial Division.

The first and most important of these is the clearing hospital, and a very able paper by Lieutenant-Colonel James and Major Pollock, read before this Society last year on the organization of this unit in the regular forces, also pointed out the great difficulties the officer commanding a clearing hospital is likely to meet with.

A clearing hospital is mobilized at the rate of one per division and should be able to accommodate 200 sick. It has a personnel of 8 officers and 77 other ranks, and I would add that if ordered to move by road, the equipment of the unit (including stores and supplies) totals about fifty thousand pounds and requires seventeen general service wagons to carry it.

It would not appear to be necessary to have quite such a large personnel in the clearing hospital for the Territorial Forces, as it would not be necessary for it to supply rest station parties, which could be formed by Voluntary Aid Detachments working in the vicinity of their own homes.

It should, however, supply a hospital section and a convoy section, and by deducting 2 officers and 14 men not required for rest station parties, a total personnel of 6 officers and 63 other ranks remains as the minimum of personnel necessary.

The first thing to be done on mobilizing a clearing hospital for the Territorial Force will be to get a commanding officer; and I would here point out that in no foreign power at the present day is the command of a clearing hospital vested in other than a commissioned officer of field rank.

I have previously remarked in dealing with regulations for Voluntary Aid Detachments, that it is intended that this officer should be found on mobilization, but I think it is hard to realize the difficulties which he would have to contend with (especially if he is a combatant officer), in mobilizing a large hospital without previous experience and a personnel unacquainted with service methods.

I would like to see this officer appointed in peace time, preferably a retired Royal Army Medical Corps officer, and he would have ample facilities for seeing and training his unit before mobilization.

Arrangements for providing the remaining medical officers to complete the strength have not to my knowledge been made, nor can I find it stated anywhere how it is to be done, but it should be possible for names of medical men to be registered in the same way as they are registered for the general hospitals, to fill these vacancies, and I would suggest retired medical officers of the Royal Army Medical Corps and Royal Army Medical Corps Territorial Forces, as being the most suitable.

The remaining personnel of a clearing hospital consists of 1 warrant officer, 8 non-commissioned officers, and 68 other ranks, all of which must be provided by voluntary aid.

In the Circular Memorandum which has been quoted before it was stated that this personnel would be provided by volunteers from Voluntary Aid Detachments amongst other sources. No regulations have, however, been laid down for registering these volunteers in peace time, and I think it would be well if each County Director received definite instructions to register suitable volunteers for the personnel of a clearing hospital, and if facilities were provided for training the unit formed with the Territorial field ambulances at their annual training.

If this scheme were followed it would necessitate their receiving rank, and I would suggest their being embodied as reservists of "The Royal Army Medical Corps Territorial Force."

Rank is necessary in a clearing hospital as it helps to maintain discipline, which is a very serious matter when dealing with a large body of hungry "sick and slightly wounded" soldiers. The Russians, in the Manchurian Campaign, with considerable foresight, established refreshment stations at their clearing hospitals with tables set out, and a plentiful supply of hot food; yet instances were reported where clearing hospitals were rushed and looted by disorderly mobs of slightly wounded men.

The provision of transport for clearing hospitals is another serious problem requiring attention. The existence of a widespread and closely woven network of railways points to rail transport playing a predominant part in the evacuation of the wounded, but it will seldom, if ever, happen that the field ambulances are able to transfer their sick direct to an ambulance train, or even to take them back to the clearing hospital; and although the clearing hospital of the Regular Army has no transport of its own, but has to rely on empty supply carts and improvised transport, there seems everything to be gained by registering transport for this unit in peace time. I would suggest

motor cars and motor buses for this purpose, suitable materials being stored for altering these vehicles for the carrying of wounded.

Canals and rivers should not be lost sight of as a means of transport, and in the Midlands and Home Counties would form valuable adjuncts to road or rail transport.

Another very important question on the mobilizing of clearing hospitals in the Territorial Force will be the provision of medical stores. At present the onus rests with the county associations, who are expected to open a central depot for the storing of gifts by private donors; but even when this has been done, the equipment stored or promised has in my experience been insufficient to fully equip each detachment in that county, and in many cases equipment is lent or given to a specific detachment.

This leads to the question whether there are not too many detachments in some counties, and also to the point whether it would not be better if all gifts and donations were given to some central authority for distribution according to requirement.

Some counties, like Hampshire, reckon amongst their population many people of means, and the number of detachments formed (some 200 or so) is far in excess of the needs of the county; whilst other counties, not so fortunate, find the greatest difficulty in raising detachments owing to the scattered distribution of the inhabitants; while the detachments, when formed, find it hard to make both ends meet.

Stationary Hospitals.

The next point for consideration is that of stationary hospitals. In the Expeditionary Force they are mobilized at the rate of two per division, and should each be equipped for 200 beds.

In the Territorial Forces I do not think such large hospitals are in any way necessary.

The general hospital will never be so very far from the fighting line, and if occasion should arise, I see no reason against their receiving many of the less severe cases of wounded that would in the Expeditionary Force be retained in the stationary hospitals on the lines of communication.

The remainder of the "slightly wounded" could quite well be looked after in small temporary hospitals formed by Voluntary Aid Detachments, and many of the detachments I have personally seen at work would be quite capable of forming and administering a temporary hospital of some twenty or thirty beds, but there

again occurs the question of maintaining discipline in these temporary hospitals. The fractiousness of convalescents and the difficult temper of "slightly wounded" arriving in crowds, famished and depressed, can only be met by stern discipline; and it would be very desirable to have a commissioned officer attached (not necessarily belonging to the Royal Army Medical Corps), who would be responsible for discipline.

If larger stationary hospitals were required, I do not think Voluntary Aid Detachments, unassisted, would be able to carry out the necessary administration to maintain them efficiently.

Another point to be considered is that of seniority. When one or more Voluntary Aid Detachments combine to form a temporary hospital, and if the commandant of the most senior detachment is a lady, will she command any men's detachment that may be attached to her unit? This may seem a point of minor importance, but some grading of officers commanding Voluntary Aid Detachments appears to be necessary, and personally I do not think it would be wise for a woman to act in any capacity other than a nursing sister or matron.

Rest Stations.

Rest Station parties have been alluded to before. Their duties will mainly be the feeding and dressing of sick and wounded at "stations" and "sidings," and these duties could well be carried out by Voluntary Aid Detachments working in the vicinity of their own homes.

Each detachment ought to be able to carry out its duties within a radius of 3 or 4 miles of its headquarters, and if maps were prepared by county directors, showing the area in which detachments would work on mobilization, they would prove most useful when hostilities occur.

On the Continent it has been found practicable, in some cases, to fix the localities of rest stations in peace time. Something of this nature I feel sure could be worked in this country, by notifying county directors of the more important railway junctions, &c., where rest stations would be likely to be required during hostilities.

Ambulance Trains.

The next unit to discuss is the Ambulance Train. Three varieties are described:—

(1) The permanent ambulance train.

(2) The temporary ambulance train.
(3) Improvised ambulance trains.

The permanent ambulance trains I think we need not bother about, as it is not likely that they will be provided for the T.F. in peace time.

The provision, however, of sufficient material in each division to provide one temporary ambulance train is very desirable.

Various ways and means of converting railway wagons into vehicles for carrying sick and wounded have been adopted by Continental armies, but the methods which appear to me most suitable for employment with voluntary aid are :—

The Linxweiler and Wulff Hoffman. The advantage of these methods being, that no screws or bolts are driven into the wagon and they can be easily packed up into a small space and the wagon used for conveying supplies on the return journey.

Whatever apparatus is chosen should be the "sealed pattern" for each county or division, and Voluntary Aid Detachments should have frequent opportunities for receiving instruction in fitting up the frames and loading them.

Convalescent Depots.

The only other units we have to deal with are the Convalescent Depots and Depot of Medical Stores. I do not think there would be any difficulty in providing for the convalescents if we had a war in this country. Names, however, of those willing to look after convalescents in their own houses should be registered in peace time. The only difficulty will be in maintaining discipline, and where any large number of wounded are together a commissioned officer would be necessary for this purpose.

Medical Store Depots.

The replenishing of the units we have just mentioned with medicines, &c., on active service is, I believe, totally unprovided for. With regard to those units which are to be formed from Voluntary Aid Detachments we have seen that their equipment is to be supplied by voluntary contributions, but it can be hardly expected when these units have exhausted their supplies, that they will be able to obtain more from the same source. The medical stores at Woolwich will be kept fully employed supplying the necessary requirements of the Expeditionary Force, and the only plan that

suggests itself to me is, that each division should contract for its medical supplies in peace time.

Each division should only contract with firms in that division, and the divisional directors might be asked to form a voluntary aid detachment of chemists, which could be split up into an advance and base depot of medical stores on mobilization, but even if this were done, it appears to be most important that each division should have an adequate supply of medical stores in peace time, which can only be accomplished by establishing a divisional medical store depot.

Disposal of Infectious Cases and Insanes.

No mention has been made of the disposal of infectious cases and insanes, and there appear to be no regulations on the subject. Sanitary officers of divisions, however, might be asked to prepare maps showing available isolation hospitals and their average accommodation, but it must not be supposed that civilian requirements will be any less during war than they are during peace, but rather the reverse. Accordingly arrangements should also be made for providing isolation camps at approved places in each division, and rolls of volunteers for duty in these camps should be prepared before mobilization. Insanes should be accommmodated in like manner at the nearest asylums.

Summary.

In conclusion I would summarize the more important points that appear to be necessary to any efficient scheme for the evacuation of sick and wounded in the Territorial Force, as follows :—

(1) Voluntary Aid should be raised and administered on a divisional basis.

(2) Clearing hospitals require to be formed and trained in peace time.

(3) A Royal Army Medical Corps Officer is needed in each division to supervise the training of the lines of communication medical units.

(4) The provision and renewal of medical stores for Territorial Force units should not be left until mobilization has occurred, but should be collected in peace time, on some such system as that of the divisional medical store depot.

(5) Some official publication is needed dealing clearly with the whole subject of the employment of voluntary aid and the units they will have to form on mobilization.

And lastly, the appointment in peace time of an A.D.M.S. of lines of communication who would be responsible for the organization and administration of the lines of communication medical units both in peace time and after mobilization.

DISCUSSION.

Colonel SKINNER, while cordially agreeing with the main contention as to the need for more complete organization in peace-time, pointed out that line of communication units ought not to be organized on a divisional basis. Although a clearing hospital was allotted to a division for purposes of evacuation of the sick and wounded, it was in no sense a divisional unit, but was under the command of the D.D.M.S. of the lines of communication. He laid great stress on the importance of furnishing the clearing hospital with transport.

Surgeon-General Sir LAUNCELOTTE GUBBINS, Director-General A.M.S., paid a high tribute to the keenness and efficiency of the Voluntary Aid Detachments. With regard to the sixty-six men required to make up the personnel of general hospitals to war strength, the twenty-three Territorial general hospitals would require 1,518 men. We now have 16,000 available. We have a total of 52,000 persons registered in voluntary aid detachments, of whom two-thirds are women. This leaves a good margin of males, *but the able-bodied men under 30 should be in the fighting units—not in the voluntary aid detachments.*

It is undesirable to limit the number of voluntary aid detachments, because this would limit the very important rôle of these detachments in training the people of this country in ambulance work. While, however, there cannot be too many detachments for peace, some limiting may be desirable for the purposes of war.

The War Office should not be looked to except in matters where large principles are concerned. Improvement and organization should be brought about by the initiative of county associations and efforts of the Territorial Force and Voluntary Aid Societies.

While agreeing that retired R.A.M.C. officers would be the most desirable commanding officers for Territorial clearing hospitals, the Director-General reminded the meeting that retired R.A.M.C. officers would be worth a very great deal in times of mobilization, and that it might not be possible to spare them for this purpose. With regard to the isolation of infectious cases, he believed that there was a superabundance of isolation accommodation available in this country, and that this point would present no difficulty.

Colonel HARPER, A.M.S. (T.F.), feared that in the absence of medical units in the evacuating zone, the movements of fighting formations would

be greatly hampered by the accumulation of sick and wounded. He asked for an opinion as to how far back the field ambulances might be expected to work in war, and as to how the sick were to be transferred from the field ambulances to the clearing hospital.

Major Waggett, R.A.M.C. (T.F.), said that the main point about our voluntary aid detachments is that they are longing for work. They are at the present time *asking* for a more complete organization. It would be a very popular step to form them into line of communication units. These voluntary aid detachments are very intelligent, and are quite capable of doing more than they are asked to do at present.

Lieut.-Colonel Bertram Soltau, R.A.M.C. (T.F.), pointed out that at present the onus of finding, raising and equipping the whole of the personnel for the evacuation and distribution of the sick was thrown on the Voluntary Aid Detachments working under County Associations. The latter were already overtaxed, and to expect them efficiently to carry out the details of organization for line of communication units on mobilization was not fair. The Voluntary Aid Detachments in his neighbourhood, while full of enthusiasm, were lacking in administrative knowledge and each detachment was trained on somewhat individual lines. Concerted action in the event of mobilization was therefore not to be expected. With regard to Clearing Hospitals, Lieut.-Colonel Soltau regarded them as the crux of the whole problem, the duties of which were far more difficult than those of the Field Ambulances. These units required just as much training as Field Ambulances, and if economical reasons made their formation impossible, it was a question whether it might not be better to cut down the number of Field Ambulances by one in each Division and substitute a Clearing Hospital. The placing of the work of evacuation on a voluntary basis placed too great a responsibility on a civilian population. For efficiency, far more preparation on a recognized and subsidized Territorial basis must be made.

Captain Sylvester Bradley, in reply, said that while Temporary Hospitals might be formed, on active service, from Voluntary Aid Detachments, this was not so with the Clearing Hospital which must be organized in peace, since it is the pivot on which evacuation turns. He regarded seven miles as the probable limit of distance between the Field Ambulances and the Clearing Hospitals. He expressed his thanks to the officers who had kindly taken part in the discussion.

Econocooker.

After the meeting, M. Emile Kiechlé kindly gave a demonstration of an apparatus known as the "Econocooker" which should be of great service for field-cooking in medical units, or in officers' messes. The principle of the cooker is that, after being heated over a fire, the food is placed inside a metal "container" lined with felt, which prevents loss

of heat; baking and roasting can be carried out without previous heating. The heat is supplied by metal discs previously heated over the flame of a "burner" and brought to such a temperature that water, when thrown on them, at once forms round droplets and runs off, or evaporates. These discs are placed one above and another below the series of cooking pots, the "container" being then put in position so as to cover the set. M. Kiechlé proceeded to roast a chicken, an operation that was successfully performed in thirty-five minutes. While the meeting had been in progress, a stew, vegetables, fruit, and other delicacies had been quietly cooking in a separate apparatus, and the members had an opportunity of seeing how perfectly successful the demonstrator had been in preparing a complete meal. The advantages of the method may be summarized as follows:—

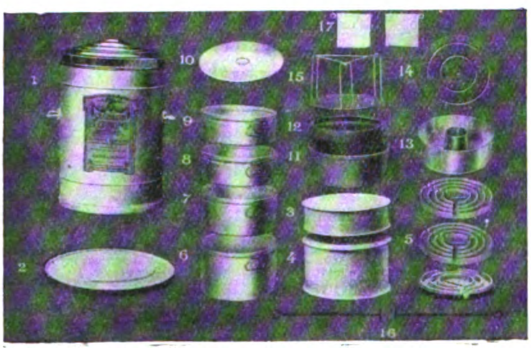
(1) Fuel is greatly economized.

(2) Labour is reduced to a minimum.

(3) There is no loss of either flavour or nutritive value, since evaporation cannot take place during the process of cooking.

(4) The food cannot be *over cooked* as the retained moisture prevents this. A meal may be prepared and left in the "Econocooker" for many hours, and yet be exactly right, and fit to be served when it is required. It is needless to point out the value of this quality in a cooker for field purposes.

The accompanying photograph shows the component parts.



Clinical and other Notes.

A SUMMARY OF OPERATIONS PERFORMED AT THE CAMBRIDGE HOSPITAL, ALDERSHOT, DURING THE PAST TWO YEARS.

By Major J. W. H. HOUGHTON, and Lieutenant GORDON WILSON.
Royal Army Medical Corps.

The following short account is a summary of the operations performed in the Cambridge Hospital, Aldershot, from July 1, 1910, to July 1, 1912.

The total number of operations requiring an anæsthetic was 1,275, and these were fairly evenly distributed between the two operating theatres.

As the records for each theatre were separately kept, it will simplify matters if the cases are collected and classified as they appear in the records of each theatre.

The number of cases operated upon in No. 1 theatre was 629; these are classified in Table I:—

TABLE I.—Cases Operated upon in Number I. Theatre.

—	No. of cases	Chloroform	Spinal	Ether	Gas	Local infiltration with Beta-eucaine
Head and neck	30	10	..	10	1	9
Upper extremities	25	9	..	2	2	12
Thorax	5	2	..	2	..	1
Abdomen (including genitals and rectum)	397	68	285	27	..	17
Lower extremities	172	12	66	7	3	84
Totals	629	101	351	48	6	123

The number of cases operated upon in No. 2 theatre was 646, of which:—

121 were operations under chloroform.
20 ,, ,, ether.
6 ,, ,, spinal analgesia.
344 ,, ,, local ,,
155 ,, ,, nitrous oxide gas.

Notes on Table I.

Under the heading of abdominal operations (including those on the genitalia and rectum) there were five cases where gastro-enterostomy was performed for duodenal ulcer. In three of these cases the duodenal ulcer had perforated, and general peritonitis was present; one of these

recovered and is now fit. Of the two cases of duodenal ulcer without perforation, both have recovered and have since remained quite fit. In one of these cases the operation of posterior gastro-enterostomy was performed under spinal analgesia alone.

There were three cases of intestinal anastomosis, two of which have already been reported (JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, September, 1911; *British Medical Journal*, December 16, 1911).

Appendicitis.—Eighty-eight patients were operated on for this disease. In 41 of these the appendix was gangrenous or ruptured. In 36 the appendix was acutely inflamed, and the remaining 11 cases were operated upon during the quiescent period. Of the 88 cases, 5 died. The remaining 83 recovered. In 62 cases the wound was closed at the time of operation, and only 26 were drained.

In a considerable number of cases in which the abdominal wound was closed without drainage, the appendix was found and removed in a gangrenous condition, but owing to careful manipulation in its removal and thorough attention to the peritoneal toilet, the wounds healed by first intention and no complications of a septic nature supervened. Of the 88 cases of appendicitis, 65 were operated upon under spinal analgesia, and 23 under inhalation anæsthesia.

Hernia.—In 130 cases a radical cure was performed; 73 of these were for right inguinal hernia—in one of which the appendix was found in the sac—and 52 for left inguinal hernia. The operation performed in all these cases was that associated with the name of Bassini. There were in addition 1 double inguinal hernia, 3 ventral herniæ, and 1 umbilical hernia.

Of the 130 cases of hernia—

96	were operated	upon under	spinal analgesia.
32	,,	,,	inhalation anæsthesia.
2	,,	,,	local analgesia.

Hæmorrhoids.—There were 34 operations for piles. Of these 32 were performed under spinal analgesia, and 2 under inhalation anæsthesia.

In 18 cases Whitehead's operation was performed.

Operations on Bones.—Thirty-five operations on bones were undertaken.

In four cases the patella was wired for fracture—all of these patients are now doing duty. In three cases the humerus was wired—in three the tibia, while the radius and femur were each wired once. In eleven cases an open operation was undertaken at the seat of fracture to correct displacement. In these cases it was not found necessary to use either wire or plating to maintain the improved position of the bones. The remaining twelve cases were for osteomyelitis or Stacke's operation on the mastoid.

Operations on the Knee-joint.—Excluding the cases of fractured patella

already mentioned the knee-joint was opened in twenty cases. Of these, fifteen were for removal of a loose semilunar cartilage, and in five other cases for disease of the knee-joint including arthrectomies for tuberculous disease.

Amputations.—There were only three amputations of a limb during this period. Two were of the leg for tubercular disease, and one of the arm for injury, the result of a motor accident.

In No. 1 theatre fifty-five cases of varicose veins were operated on—the anæsthetic used in forty-six being a solution of beta-eucaine and adrenalin, while in seven cases spinal analgesia was used, and in two cases inhalation anæsthesia. The preponderance of cases in the first group calls for a few remarks.

The local analgesic solution used was that formulated by Mr. Barker of University College. It is made up as follows:—

Beta-eucaine	0·2 grm.
Pure sodium chloride ..	0·8 ,,
Aq. destill.	100 c.c.

The solution is made in bulk, and when required for use 100 c.c. are taken and boiled in a flask. When cool ten drops of a 1 in 1,000 preparation of adrenalin chloride are added to this amount.

The routine method is as follows: The area to be operated on is prepared in the usual manner, and the course of the varicose vein is marked by means of a needle scratch. At the time of operation the course of the vein is injected subcutaneously on both sides with this solution. A short period, usually fifteen to twenty minutes, is allowed to elapse before commencing operation. At the end of this period the injected area presents a blanched appearance, and is quite ready for incision. The amount of the solution necessary to analgese a varicose vein is about 10 c.c., but large quantities of this solution may be employed without fear of producing toxic effects. In all the cases in which it was employed, this solution acted admirably, the patients experiencing neither pain nor discomfort. The advantage of this method is the avoidance of a general anæsthetic, often a point of considerable importance, while it is hardly necessary to state the advantage of being able to carry out the whole procedure single handed. Absolute asepsis is required in the use of local infiltration, but with the usual precautions this can easily be maintained. With regard to the introduction of the solution subcutaneously any syringe with a fine needle may be used, but a syringe of 10 c.c. capacity is preferable. In conclusion we wish to draw attention to the complete safety of this procedure, and recommend its use as a routine measure for small operations.

The operations in No. 2 theatre were mostly of a minor character. The total number performed was 646, and they may be classified as follows:—

On connective tissue	.. .. ..	557
On ear, nose, and throat	.. .. ..	53
On bones	.. ..	36

Connective Tissue.—This heading includes operations for abscesses and inflammatory conditions.

Ear, Nose and Throat.—Amongst these were operations for the removal of tonsils and adenoids, and several cases of submucous resection for deviation of the nasal septum.

A MODIFICATION OF THE BURRI METHOD OF DEMONSTRATING *SPIROCHÆTA PALLIDA*.

By Major L. W. HARRISON.
Royal Army Medical Corps.

A disadvantage of Chinese ink for demonstrating *Spirochæta pallida* is that unless it is prepared by centrifugalization or, as Captain Frost has recommended, by the addition of tincture of iodine, the field is too granular to make the detection of *S. pallida* at all easy.

I have found that a more homogeneous field is easily obtained by substituting for Chinese ink a suspension of collargol. The suspension is prepared according to the directions of the makers (Chemische Fabrik von Heyden), one part of the powder being made up with nineteen parts of distilled water. The powder is first put into a black bottle (or an ordinary bottle wrapped round with black paper) and the distilled water poured on it. After standing for a few minutes the bottle is well shaken and again allowed to stand, it is shaken again and is then ready for use. The suspension is used exactly as if it were Chinese ink, a loopful of the suspected serum and one of collargol being mixed together at one end of a microscope slide and then spread like a blood-film.

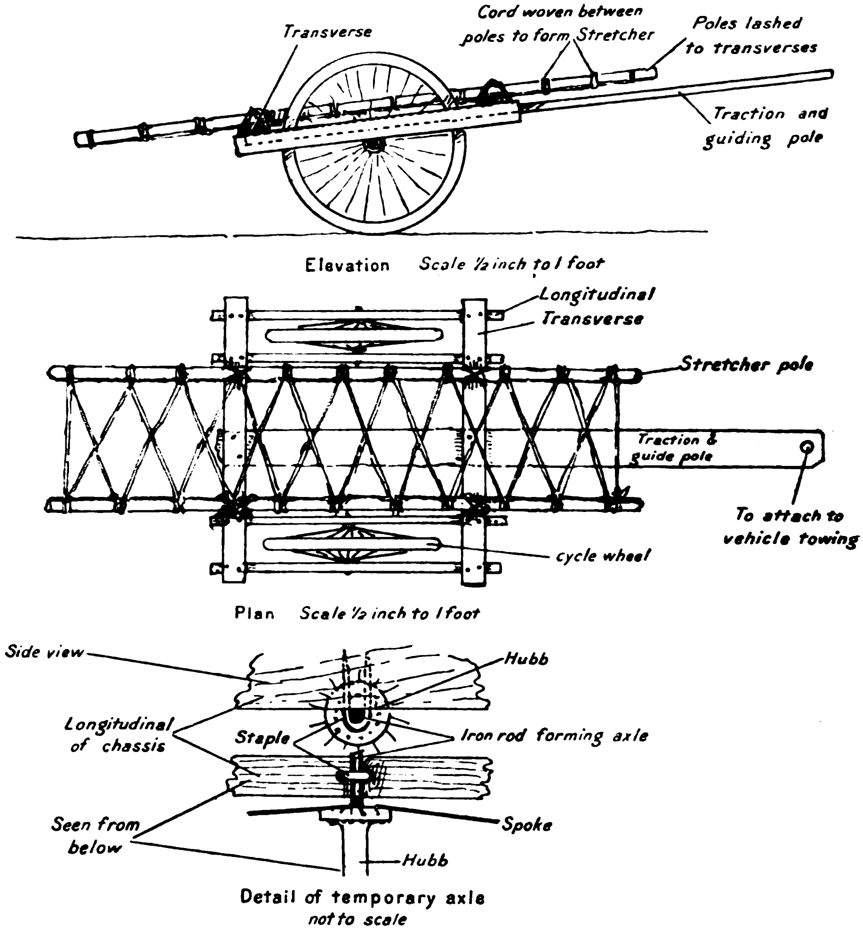
The film may be examined with an oil-immersion lens as soon as it is dry; spirochætes appear white on a reddish-brown field which is almost perfectly homogeneous. The examination requires a fairly good light, but good daylight is sufficient.

As a diagnostic measure this method of demonstrating *S. pallida* has the same disadvantages as the Chinese ink, the chief of these being loss of the characteristic movements of the spirochæta. Under dark-ground illumination I have seen extremely delicate spirochætes in the secretion obtained from the surface of sores which were non-syphilitic. I would therefore strongly urge that particular care be taken to clean the sore beforehand so as to prevent surface organisms from contaminating the exudate from the deeper layers.

AN IMPROVISED CYCLE FOR THE CARRIAGE OF WOUNDED.

By Lieutenant-Colonel H. E. R. JAMES, C.B.
Royal Army Medical Corps, Retired Pay.

This contrivance, the invention of M. Borillon (*Le Caducée*, September 7, 1912), was used by the Geneva section of the Red Cross on the occasion of a practice at Chênebougeriec on June 23, and was found to



be fairly rapid on good roads, very silent, and easy running. It consists of a wooden chassis mounted on two bicycle wheels, and carrying an improvised stretcher; it is drawn and guided by means of a long piece of wood which is attached to the chassis, and connected with whatever machine is used for traction (bicycle or car).

The diagrams are taken from the photograph, which is not very clear as to detail. The description given is as follows: The essential

part is represented by two bicycle wheels (which must be taken off the bicycle). Four pieces of wood of about 40 in. in length are fixed by their middle to a piece of iron rod which forms the axle of the wheel. If an iron rod is not to hand then band iron folded several times upon itself may be used. Each wheel being thus enclosed between two pieces of wood, these are fastened by traverses to keep the pieces of wood apart and to carry the stretchers. This assemblage forms a sort of chassis and all that remains to be done is to fix on two pieces of wood about 7 ft. long which will serve as poles, on which a cording is woven, which in its turn is covered with straw. The traction pole is fastened to the middle of the under side of the front traverse and nailed to the hinder one, and consists of a plank of a length to be determined by the nature of the case, so as to adapt the slope of the stretcher to the height of the machine employed to draw it.

If nails are used for fastening the parts they should be long enough to clinch, and string used for tying should be wetted. A hooped stick to carry a sheet to shelter the patient is described and pictured. The contrivance, if well made, would no doubt be useful, but it would require good work to make it safe and easy. It implies the dismantling of a bicycle and damage to its bearings. The following would be necessary: Six pieces of wood 40 in. by $2\frac{1}{2}$ by $1\frac{1}{2}$ in. (for chassis); one piece 8 ft. by 6 in. by $\frac{3}{4}$ in. for traction and guide; two poles 7 ft. by $2\frac{1}{2}$ to 2 in.; two pieces of $\frac{1}{2}$-in. iron rod 10 in. long, or two pieces of $\frac{1}{2}$-in. band iron 40 in. long; two iron staples $\frac{1}{2}$-in. aperture, $\frac{1}{4}$ in. thick; two bicycle wheels; thirty yards of small cord; twenty 3-in. wire nails.

REPORT ON A CASE OF OPERATION FOR APPENDICITIS WHICH EXHIBITED UNUSUAL FEATURES.

By Major F. J. W. PORTER, D.S.O.
Royal Army Medical Corps.

Private A. was admitted to the Station Hospital at Secunderabad, on June 17, suffering from chronic appendicitis. The symptoms were very mild, but the history quite definite. Under spinal analgesia (novocain) I removed his appendix on June 19, at 8.30 a.m.

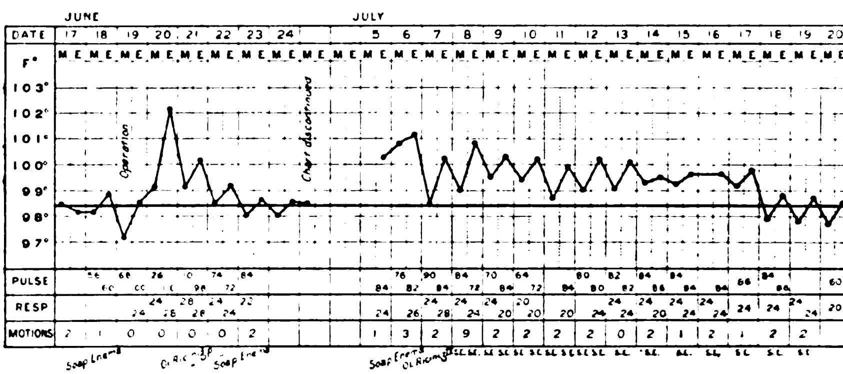
The condition found was as follows: Congested omentum appeared in wound; the cæcum was infantile and very difficult to deliver. The appendix was very long and very much inflamed. There was a double twist in the longitudinal, and an acute kink in the transverse axis. The mucous membrane was intensely ulcerated. He had a good deal of headache after the operation and frequent vomiting, but his pulse was good and his temperature only 98·6 in the evening. He was restless during the early part of the night, but after 3 minims of inj. morph. hypod. at 12.30 a.m. he slept till 5 a.m.

He awoke cold and clammy, pulse 126, temperature 99°, and complaining of a feeling of acute distension in the epigastrium and much

præcordial pain. The lower part of his abdomen was quite normal. He had liq. strych. ♏v. at 6.45, followed by atrop. sulph. gr. $\frac{1}{100}$. This was repeated two hours later. At 9.30 he had 18 oz. of saline subcutaneously, and 16 oz. at 2 p.m. All this time—vomiting of blood-stained fluid was rather copious—and no improvement in his pulse could be made out. His condition was distinctly critical.

At 2.30 p.m. I gave him an ampoule of pituitary extract (20 per cent.) hypodermically; improvement in his pulse and general condition was soon evident. By 7 p.m. he appeared to be out of danger.

His symptoms were recognized as those of acute post-operative dilatation of the stomach, and were similar to, though less acute than a case I had at Colchester some years ago, after an appendix operation. The distension of the stomach was not sufficiently severe in this case to call for the use of the stomach-tube as in the previous one.



The operation wound healed by first intention and he was allowed up on June 26. He looked, however, like a man who had been through a very serious illness.

He remained well until July 4, when he complained of some tenderness in the right iliac regions. There was nothing abnormal to be felt. On the evening of the 5th his temperature was 100·4°. Next evening his temperature was 101°, and there was a large round swelling, very tender on pressure, beneath the lower part of the right rectus.

He was thought to have either an accumulation of fæces in his colon, or possibly an abscess round the invaginated stump of the appendix. A large enema was given and ol. ricini ʒi. This had a good result.

On the evening of the 8th, the swelling had increased to such an extent that I decided to explore it next morning. It diminished, however, so greatly during the night, that I decided it must be due to fæcal accumulation and thickening of the wall of the cæcum.

An enema twice daily was given until July 20, when all swelling had disappeared and the temperature was normal. His further recovery was uneventful.

Travel.

THE PENSIONER'S PROBLEM—THE ATTRACTIONS OF VANCOUVER ISLAND.[1]

By Major PERCY HOPE FALKNER.
Royal Army Medical Corps.

To the British officer the question of employment after retiring from the active list is often an important and anxious one. The prospect of eternal club life is not attractive to a man in the prime of his days; in fact, to many such an existence would be an undesirable prospect. There are frequently a wife and family to be thought of, and generally a small income which even with care will not do more than supply bare necessities at home. Now these people are not, for many reasons, always fitted for the discomforts, &c., which are involved in the farmer's life. Their training and surroundings during their service do not often fit them for such work, however much it may appeal to them; yet, I am afraid the emigration "plunge" is not infrequently taken without due consideration of these things.

The selection of a climate is an important matter, and it is not advisable for every one who has had prolonged service in India, &c., to suddenly change to conditions such as we have them in Eastern Canada. Further, the scenic surroundings do weigh with us in selecting a future home. The prospect must also hold out some likelihood that the small income referred to can be supplemented, and that the young family can have a chance of "making good" in due course. Last, but not least, there is the social element, and this frequently, to my certain knowledge, decides the whole question. The lady must have society and its attractions, as on no account could she suddenly drop what she has been accustomed to for many years in this respect. That such is the case can hardly be wondered at.

To recapitulate we must have :—

(1) A good climate with pleasant surroundings, including sport.

(2) We must be able to supplement our small incomes in an industry of which as yet we know practically nothing.

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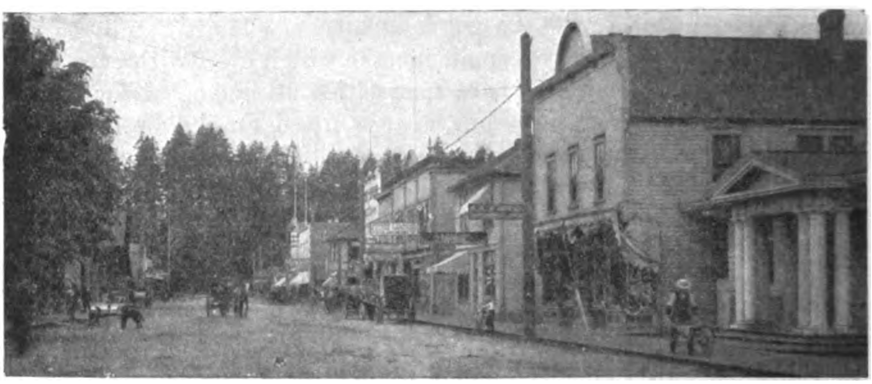
[1] Reprinted from *Canada* by permission of the Editor.

(3) There must be good openings for our sons, not to mention the girls when they reach the marriageable age.

(4) The social conditions must be correct for Madam.

Now many of these requirements may appear frivolous to the civilian, but he would quickly alter his opinion if he had experienced a world-wide military service extending over twenty or thirty years. Further, they are well understood by the promoters of various propositions both in British Columbia and out of it, as can easily be seen by reading their literature. I believe I have now solved this question of retirement, although two years ago I had hardly given the matter much thought. At that time I had the good fortune to be serving in Bermuda, and decided that I would go



Station Road, Duncan, Vancouver Island.

to Canada and see for myself. I at once obtained piles of books, pamphlets, and what not, from all directions. These had special reference to various properties for sale, all "eminently suitable," many of them recommended by men who, almost to a certainty, had never been to Canada at all. Many of these properties were sound, and others certainly the reverse.

I obtained leave of absence, and crossed Canada with another officer. We visited many and various places in Ontario, Quebec, and British Columbia. We took advice from every one, and at the finish were more confused than when we started. No place visited came within the scope of my four points. Almost in despair, we decided on an extension of our tour to Vancouver Island. This we carried out, and finally arrived at Duncan, in the Cowichan District. This small city is situated some forty miles north of Victoria, on the

E. and N. Railway, while close by are the Lakes of Quamichan, Somenos, and Cowichan. Within some three miles the seaside resort of Maple Bay adds to the many attractions of the place.

It is difficult to speak in moderation of the beauties of this delightful country. Many naval officers have told me that Vancouver Island is "God's country," and Duncan will certainly need a lot of beating in this respect. The country rises and falls sufficiently to make the scenery perfect. Lakes, rivers, moors, and magnificent pine woods made the experience worth having as we sped along the perfect roads in our motor. Delightful houses of the bungalow type were visible on all sides, each surrounded by cleared farm ground, upon which the owners engaged in their own special line of industry. Many of those I met were ex-Service

Quamichan Lake, Duncan, V.I.

men, and one and all stated that they had never regretted their choice of this locality.

As regards industry, there is a wide choice. The district is famous for its butter and cream, but poultry is rapidly overtaking this, and will, I believe, be the leading industry in time to come. The returns from either are excellent to those who understand the work, and for others who do not Government advice can be had from the experimental station in Vancouver free of cost. The poultry and fruit industries can be combined to their mutual advantage, whilst, of course, general farming is lucrative, if handled in an efficient manner. A Co-operative Creamery is run by, and for, the benefit of the actual producers themselves. Not only does one obtain the very best market prices right at one's door, but a second profit is returned to the owners, after working expenses have been deducted. The various feeding stuffs are stocked and

handed to the members at wholesale prices. Incubators, poultry appliances, &c., are also held, whilst those needing advice can obtain this on request. This institution has certainly added much to the successes of the district, and it is wise to locate one's property as conveniently as may be to it, for the reasons given.

The soil is chiefly a red loam, running to a considerable depth, with a gravel subsoil. The bottom lands are deep black loam, which will produce enormous crops. Nowhere can this black soil be beaten, either from analysis or from a practical point of view. The land chosen for poultry or fruit culture will obviously not be always the kind required for dairy work, but this matter is a simple one for those who adopt the wise precaution of selecting the property personally. Irrigation is not required.

Poultry Farm, Quamichan Lake, V.I.

The climate is somewhat like that of the South or West of England, but much more agreeable. The rains are heavy, but fall mostly in winter, so that as an all-round climate it is one of the most perfect in the world. Snow and frost cause no trouble, neither do the biting east winds such as we experience in many places in Great Britain. Without a good rainfall we must expect a barren and desolate looking country, however good it may be made for fruit culture, &c., by expensive systems of irrigation. This has been my experience not only in Canada but elsewhere. From about March or April to November the climate is delightful, bright sunshine being the rule and not the exception ; and one does not suffer from the extremes of heat or cold, as neither are in excess of one's requirements.

A few details regarding the poultry industry will not be amiss. There are large areas of land suitable for the industry which can be had for £20 ($100) per acre, more or less. This when simply

slashed and seeded to clover will yield as large returns with poultry as more expensive land. It is certainly advisable to get well-drained soil, sufficiently good to produce grain, fruit, or vegetables, because if poultry constantly occupy the same ground it becomes contaminated, but if the rich soil is alternated between poultry and crops of any kind many marked advantages are secured by each department. The yield from average good stock works out at from $2 (8s. 4d.) to $3.20 (12s. 10d.) per head, average profit. The man is fortunate who can secure an average of 5s. per head in Britain. The higher figures would represent sales of hatching eggs, stock, &c., in addition to the main output, which is marketed in the usual way through the Creamery. The climate cannot be beaten for the poultry industry in its many departments.

Fruit and Poultry Ranch, Somenos Lake, near Duncan, V.I.

Clover yields large crops practically all the year round, and this is of vital importance, as it is a foodstuff of great value, besides purifying the ground at the same time. Fruit will yield good returns in conjunction with poultry culture upon the same ground. The trees, whilst supplying an absolute necessity in the form of shade in summer, will be greatly benefited by the poultry manure. Not only this, but many insects, &c., injurious to the trees, will be removed by the ever-watchful flock.

Markets are ever increasing in both number and size. A large proportion of the people in this Province are not producers of farm produce, as, for example, the mining communities. The two cities of Victoria and Vancouver are practically at our door, whilst increasing demands upon the output are being secured from Alaska and Yukon. The Prairie Provinces, though becoming rich at a phenomenal rate, are practically dependent upon outside supplies of eggs, fruit, vegetables, &c. The result of this is that

we can secure for butter 45 cents to 50 cents per lb. in the winter, and an average of from 33 cents to 40 cents in the summer, for all that can be produced and more. The returns of the Cowichan Creamery in 1907 were $57,139, and in 1908 $61,167, and these results have largely increased year by year up to the present time. A large amount of money is leaving the Province of British Columbia annually for poultry products.

Sufficient has been said to verify the statement that the present and future prospects of the various Duncan industries could not be more promising, and it will be many years, if ever, before the demands upon her produce will fully satisfy market requirements.

Sport, &c., is practically unlimited, and of the most attractive kind conceivable. The district has two tennis clubs and a first-

The start in the Long Distance Race, Cowichan Bay, Duncan, V.I.

class golf links, while polo, cricket, &c., &c., are all provided for in this way. A Yacht Club was lately in the process of formation, but this has been temporarily delayed. The fisherman has at his door probably one of the best regions for sport that Nature can supply. Lakes, rivers, and open sea provide unlimited numbers of salmon, grilse, trout, &c. The English pheasant is very numerous, as are quail, snipe, duck, geese, and so on, *ad infinitum.* The district is provided with an efficient telephone service, and before the present year is out a scheme of electric power will be arranged for the young city sufficient for all future developments, including, of course, electric light. The power is available at the Cowichan River Falls, about eleven miles from the city, and the cost of transfer will not be a large one.

Many men of mature years are taking up land for residential sites, pure and simple. The prices of land are increasing in the

district. Fair agricultural land can be had from $150 to $250, whilst bottom land runs higher. Residential sites are changing hands at as much as $3,000 per acre, for exceptional lots in the best localities. Not the least important point about the city is its proximity to Victoria. What could be more enjoyable than a run of forty miles in a good train, through magnificent scenery, with the prospect of a day in one of the most attractive cities in Canada?

In concluding, I must state that I am not financially interested in the country described in any way, with the exception of the property I own there, and this is not for sale. Should any officer require further information, I shall be only too pleased to give him such, to the best of my ability, if he will communicate with me through the Editor of *Canada*.

Echoes from the Past.

CONCERNING THE ARMY MEDICAL DEPARTMENT.

By Surgeon G. J. H. EVATT, M.D.

Attached to 25th (King's Own Borderers) Regiment, Jubbulpore, India, February, 1875.

(*Continued from p.* 640.)

Section IV.—The Unification System

(40) We now turn to discuss the unification system, or the principle of handing over to the Army Medical Department the fullest control over the Medical service of the forces, subject at all times and in all places to the command of the chief Military authority present either in garrison or in the field.

It would be absurd to ignore, in discussing this question, the causes that are at work in the medical department promoting the desire for unification. No profession has during the past fifty years made anything like the social progress ours has done. Better men, with better education, and wider views join it every day. When one remembers the position it occupied in not very distant times by comparison with the sword, the Church, or law, no one can deny that it has risen amazingly, while its position is every day more liable to assault. Large armies and volunteer military systems have made military rank common, the *odium theologicum* has died out

amongst rational beings, disestablishment is held as a threat over every state religious organization, and the codification and simplification of the law will render the number at least of that profession fewer. But as civilization advances the need of the medical art increases, doctors become more valuable, and rise to their true social position. Considering the expense, the trouble, and the danger of their education and their labours, it is but their just due. These influences act in full force upon the Army medical officers and each succeeding decade and each succeeding war but raises and will raise their value. If former Army doctors were satisfied with small pay and indefinite position, the present men are not.

We desire to serve England faithfully and well, and to give our best energies to the Army we belong to, and with which we have done devoted service; but we desire to do that service in the best and most sensible way, and to have our hands untied to do the work. Repose trust in us, give us responsibility, give us the power to organize; then, if we succeed, give us the praise; if we fail ours be the blame. What then are the aims of the supporters of unification views and what the advantages their system holds out?

(41) (*A*) *Centralized Responsibility in the Medical Department.*—It means first that we shall have in each garrison, with each Brigade, and Division, or Army Corps a single authority responsible for the medical care of the soldiery, with power to direct all the energies of the department in the direction where there is most need of them. Under the control of that authority the Medical Corps of the Army, officers, attendants, hospitals, equipments, and transport, will in certain fixed proportions be placed. To the Principal Medical Officer in each Brigade or Division the entire Medical Staff of that Division will look for instructions and for co-ordination. He will arrange that no hospital shall remain empty while another is full to overflowing. That the duties of the medical staff are equalized. That when needed to act in small parties, detached portions of the Army Hospitals with sufficient officers, attendants and equipment accompany the force, not in proportion to the numbers of its separate Regiments or Batteries, but in proportion to its total strength and its probable needs. All divided responsibility between the commanders of separate regiments and the senior medical officers will cease, and in the Principal Medical Officer under the Commanding General all responsibility and guiding power shall centre, leaving each regimental commander free to attend to his regimental duties proper. In like manner in garrisons all the sick shall be treated in central army hospitals, there being

with each regiment a permanently attached medical officer who will *send* the men to hospital when sick or wounded, treat the sick officers and their families out of hospital and accompany the regiment wherever it may go. In the central hospitals all arrangements for duty, division of labour, discipline and administrative authority shall centre in the senior medical officer, subject at all times to the authority of the officer commanding the garrison or the army or section of the army in the field.

(42) (*B*) *The Formation of First-class Garrison Hospitals.*—Instead of a number of petty hospitals scattered over a garrison there will gradually be formed first-class garrison hospitals with every modern appliance and comfort for the sick. Chemical laboratories, expensive instruments, libraries and museums will in these centres gradually accumulate. There medical officers can learn their profession more thoroughly, consult freely with one another, have every available modern professional assistance, and learn how to administrate and preserve order in the hospitals.

(43) (*C*) *Great Economy by Co-operation.*—Instead of having in a single garrison eight or ten microscopes or such like things, one alone will be needed. Cooking, washing, lighting, all will be carried on in a more economical and equally efficient manner: of its economy there can be no question.

(44) (*D*) *War and Peace Hospital System the Same.*—No change will take place between the systems in war or peace, and the terrible danger of inaugurating new systems in the field be avoided. To this error in the old days we may attribute the maladministration of the war general hospitals.

(45) (*E*) *It gives a Station Tradition of Diseases.*—As the medical officers of each garrison will be permanent for a certain time, and will not all change at the same time, it enables a station tradition of the sickly seasons, local causes of disease, and best steps for avoiding them to be handed down, a thing wholly impossible before.

(46) (*F*) It enables the medical department to limit or increase the medical staff in each garrison according to its healthy or unhealthy characters, which could not be done with fixed regimental establishments, and enables the Divisional Principal Medical Officer to withdraw or increase the staff from neighbouring stations when needed.

(47) (*G*) *Good Nursing.*—By having a special corps of medical attendants it enables men to be trained as nurses and gives them scope for promotion if intelligent, which was impossible under the old system.

(48) (*H*) *Avoids Friction.*—It puts an end to or diminishes to the least possible amount all friction between the military and medical departments of the army. Contact can only take place between the administrative chiefs of either departments, and the subordinate officers shall be simply the officers of two separate corps.

(49) (*I*) *Equalizes Foreign Service.*—It enables a roster to be kept of the home and foreign service of the medical officers, and equalizes it for all. It prevents a man spending his whole service in England or being compelled to spend excessively long times in India or the Colonies.

(50) (*J*) *A Single Uniform.*—It enables one definite uniform to be determined on for all medical officers of the army, by which they can be always recognized, and which will avoid the wretched questions about invidious distinctions and absence of ornament or decoration. It will prevent the anomaly of medical officers being compelled to wear the uniform of corps to which they never really belonged, and will save a few weak-minded men from forgetting that they are medical officers, and dreaming that they are Hussars or Artillerymen.

(51) (*K*) It gives us the opportunity in each garrison of having suitable accommodation, where we can organize our own messes, and gives the young officers of the department a home, which if they served on the staff they never could have had. This is a most important advantage. The absence of messes under the old system was a great injury to the *morale* of the young medical officers.

(52) (*L*) *Abolishes Regimental Medical Officers' Seniority.*—It abolishes the anomaly of a junior medical officer commissioned in a regiment being senior there to the oldest staff medical officer or medical officer of another corps.

(53) (*M*) It makes a uniform system of having every man not at duty on medical grounds in hospital, and puts an end to constant regimental breaches of the existing army rule.

(54) (*N*) It makes leave of absence easier to be obtained for the medical officers.

(55) (*O*) It does away with the annoying inspections of hospitals by junior regimental officers; a duty many of them objected to, knowing it to be a farce.

(56) (*P*) It enables good and healthy sites for hospitals apart from the regimental camps or barracks to be chosen. With regimental hospitals close to barracks and camps, the same evil influences acted on the one as on the other.

(57) (*Q*) It saves the furnishing of regimental guards to regimental hospitals, and requires but one guard for a whole garrison or division instead of six or eight as at present.

(58) (*R*) It enables indifferent senior medical officers to be employed under seniors, while under the regimental system all seniors had to be employed as chief medical officers in regiments.

(59) (*S*) It enables us to get rid of *mauvais sujets* in the department. In the regimental system if a medical officer was a "good fellow" at mess and popular, his commanding officer could overlook his conduct in the hospital, and he alone could take cognizance of it. In this way indifferent officers were at times retained in the service.

Section V.—What still remains to be done.

(60) If any officer of the military or the medical department of the army imagines that by the introduction of the new system the medical officers aim at doing less work or leading easier lives, they are thoroughly and entirely mistaken. It means harder work, more responsibility, more forethought, and more attention to duty than ever was necessary under the old system.

The medical department will now be entrusted with most arduous responsibilities, but they will have their hands untied to accomplish the work.

Deprived of the swathing bandages from which they so long derived a false and ruinous support, the limbs of the department may and will totter at first, but in the end the firm step and decided gait will be theirs.

Mistakes and errors are likely to occur when we commence our new labours, but the great thing to remember is that now while peace exists they can be noted and corrected, whereas they were certain to have occurred in the first campaign under the old system, and would have involved disaster. It was as certain that any great European campaign before 1873 would have been disastrous to the medical service of the army, as it is certain that men died of preventable sickness in the Crimea. What then are we to ask for and to aim at under the new organization?

(61) (*A*) *Disciplinary Powers*[1] *in Hospitals over Officers, Attendants, and Patients.*—Foremost amongst the wants the new system will involve will be full disciplinary powers in the station hospitals

[1] Granted by Royal Warrant of August 11, 1877.

in the field and in garrisons over officers, attendants, and patients. No order can exist without that being granted, and now during the time of peace is the time to give it fully to the medical officers. The senior medical officer of a garrison should have the powers granted to a regimental commanding officer for the punishment of military offences, that is up to 168 hours' cells, the power of confining to barracks, and of fining for drunkenness.

We all know these powers will be rarely used, yet it is necessary they should be there for use. All references to the commanding officer of the station will be tedious, and involve much trouble to every one. These powers the medical officers are quite qualified to use, and if mistakes occur at first they can be corrected now in peace times. The medical officers now senior in the army are well acquainted with the routine of the service and will use these powers with discretion. Every one knows that in India the Indian Medical Service governs the enormous jails of that country and exercises magisterial functions even to the extent of corporal punishment, efficiently and well. This power will prevent medical officers resorting to the irregular customs of old days, in which it is said perfectly illegal punishments, like feeding on spoon diet, were given constantly to soldiers in hospital for any breach of regulations. This power should extend over the subordinate Indian medical attendants,[1] who will form the nucleus of the Indian Hospital Corps. On all courts-martial on medical officers a proportion of medical officers should sit as members, to see that no absurd plea prevented justice taking effect on delinquents. Medical officers as is well known to-day sit on courts-martial, and it should be the rule in the trial of all hospital subordinates.

(62) (*B*) In future it will be necessary to have any new army hospitals built for the garrison and not for the regiment.

(63) (*C*) The Army Hospital Corps should be wholly under the medical officers in every particular, and Quartermasters[2] chosen from the non-commissioned officers should be commissioned and attached to each district at home, and each division abroad, to look after their clothing and payment. Their uniform should be changed to the scarlet colour of the medical staff of the army with the same facings. Their title should be the same as that of the medical corps and in every way they should be taught to look to the medical

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[1] Granted 1881.

[2] The Captains and Lieutenants of Orderlies became Quartermasters from July 1, 1881.

officers in every thing. If their discipline be at all defective, it arises from the absence of any interest in their welfare by the medical officers, and now under the new system this should not be the case. They are our own corps. That they should be efficient is our best hope, and if they fail we are undone. Every means should be taken to make them comfortable, for their duties are particularly onerous and depressing.

(64) In India it will be necessary to organize the present Native establishments into a Native Hospital Corps.[1] This can easily be done, and the late Surgeon-General Beatson has left on record a plan ready for adoption. The uniform of the subordinate medical department in India should be made similar to our own, and the Geneva Cross worn by the whole medical corps, from the most senior officer down to the most junior orderly.

(65) (*D*) It will be necessary to have hung up in every barrack-room instructions explaining the system of army hospitals to the men that no mistake can occur; very soon it will be fully understood. No explanation of the meaning of the Geneva Cross has as yet been given to the army, and most men believe that the Geneva Convention discussed the Alabama claims. This should be corrected.

(66) (*E*) The ambulances that would accompany the army in motion should be kept mobilized and in working order at Aldershot and the Curragh, to train men to the system, and constant practice given to the officers, attendants, horses and waggons as if in the field. The young medical officers from Netley should be sent to see the system working as part of their course. Officers will always learn the routine of the General Hospitals, but the management of the ambulances can only be learned at the large camps. No expense will fall on the State, as the waggons would be used for conveying the regimental sick from barracks to the hospitals at ordinary times. Medical officers detailed for service with these should be horsed at all times, in the same manner as the field artillery officers are.

(67) (*F*) *Netley.*—With unification the Netley training of the young officers becomes of the greatest importance. When one notices the care given to the young Royal Artillery officers at Woolwich and the Royal Engineer officers at Brompton, it merely indicates how necessary like care is at Netley. There should be there a publicly appointed officer of much army experience as

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[1] Granted 1881.

" Superintendent of Cadets," to whom the young officers could look for instruction and guidance on all questions not dealt with by the professors and medical officers of divisions. Our young brother officers enter there a new career, and very much depends upon the impressions they receive. Unless their care be the special duty of a responsible officer it may be neglected, and this should not occur. The traditions of the service and the department are not learned in a day, and the young cadets should be carefully taught them. All of them are anxious to learn, and doubtless in the future great care will be taken on this head.

(68) They should be taught to ride at Netley if possible, or by sending them to Aldershot; but the best way is to let these young gentlemen learn at Netley amongst their own people. A medical officer who cannot ride is useless and an encumbrance to the service. The state may well demand of its officers an efficiency equal to that demanded from every medical practitioner's assistant. A short course of drill should be given.[1] It would teach them more of the sufferings of the soldier with badly fitting accoutrements than many lectures. The first day I dressed in heavy marching order I learned a lesson from the old pack I have never forgotten. They should likewise be instructed in the elements of Military law.[2] The Superintendent of Cadets could, in half a dozen lectures, teach these young officers much that they now have to learn in the rough school of experience. We should all be induced to look to Netley as our centre, and our best and happiest station.

(69) (*G*) The formation of medical staff messes at all the larger garrisons is most important. At Aldershot, Woolwich, Portsmouth, Plymouth, Dover, Dublin, the Curragh, Cork, Gibraltar, Malta, Poona, Bangalore, Secunderabad, Allahabad, Lucknow, Meerut, Morar, Umballa, Mian Mir, and Rawul Pindi, and Peshawur such messes should be at once organized. Nothing is of greater importance to our *morale* than this. We must not be dependent on the regimental establishments that the young men may have a place to meet. I see no reason to excuse any medical officer from payments to these institutions, and the rules applying to regimental messes should likewise apply to them about subscriptions.

(70) If the department is to stand amongst the other branches of the Army there must be a centre where the social amenities of life can be carried out. Entertainments if given should be in the name of the senior medical officer and medical officers of the garrison.

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[1] Granted 1877. [2] Granted 1877.

Cards should be left on regiments or individuals in the name of the P.M.O. and officers of the Medical staff, and all invitations should come for the officers of the medical staff as a body. But it is needless to mention these things save casually. However, simple as these things seem, they are not unimportant. The Regent's allowance as given in the line battalions might be claimed in England, but in India the mess allowance of Rs. 10 per officer for mess-house accommodation should, as in the Royal Artillery, certainly be granted to the department. It can in no possible way be refused and only needs representation.

(71) (*H*) The honorary distinction "Royal" should be given to the department, and likewise to the Army Medical School at Netley. It is the rule in the service to give this honorary distinction to corps and regiments that have done good service. If there be Royal Artillery and Royal Engineer and Royal Military Academy, there should be likewise Royal Medical department. Our labours, our devotion, our long and faithful services exceed if possible even these distinguished corps. Nothing shows more painfully the bad effects of the regimental system on the medical officers themselves than the utter absence of *departmental* tradition. There should be honorary mottoes and badges as in every other corps in the service, and that badge should be the Geneva Cross, which if we will we can make the most honorable badge in the army. It is absurd to despise these little things. "Trifles make perfection, and perfection is no trifle." The history of the department should likewise be written.

(72) (*I*) *With reference to dress*, a few principles should be laid down. I have yet to learn whether our influence, prestige, respect, or position is to be increased by despising and ignoring our uniform. I have met officers who believed such would be the case. They were not remarkable for any superiority. Uniform means order, and system, and in the military service can never be ignored. Under the regimental system wretched distinctions made by absence of ornaments were in the old days the rule, and even to the present time more or less acted upon. Now as we are a separate corps we want the medical staff uniform, already very fair, made in every way as good as the best in the army. We all agree that though the taste for gold lace is a false taste, yet while the army wears it we will sail with the stream. We are but men after all, and although our dress should be *perfectly* distinctive it should not be ugly. Hence the cocked-hat for all except the administrative officers, the forage cap and the undress trousers need change to equalize them with the Engineers, with whose position we are most nearly

allied. The dress belts should always be worn as the Engineers always wear theirs. The Geneva Cross worked in ornamental embroidery should be worn on the forage cap, on the collar of the tunic in front of the rank badges, on the collar of the mess jacket, and on the front of the helmet or hat that is to be worn, and on the collar of the patrol jacket. It is better to adopt this badge in peace as we must wear it in war, and let it become known as the medical department badge. If worn only in war times our men will never understand the meaning of it. The collar and cuffs of the patrol jacket should be of the same pattern as the Engineers, black velvet being substituted for garter blue.

Distinct and clear orders should be laid down about our dress when on various duties. All mistakes arise with us from want of clear definite orders on this as on other subjects. The Honorary Physicians and Surgeons to the Queen should wear the tunic of the Queen's A.D.C.'s with their own belts. If the army tailors do not object, perhaps as an outsider one might suggest something. Our facings are black. We adopt the colour. All broad lace worn by the department should have a quarter of an inch of black in the centre, where the military department wear crimson. This broad lace will suit for the forage-cap band,[2] and for the trousers in full dress : for the undress trousers let a black stripe, half an inch wide, run down a broad scarlet band. Advantage might be gained by choosing some good London house, and treating with them for the supply of uniforms to the department as a speciality. Our uniform will now be the same for a corps of a thousand officers. It should pay a house well to secure the patronage of so many officers. The co-operative principle would be the one followed.

(73) (*J*) *Titles.*—While we serve in a military organization, and deal with soldiers accustomed to respect their officers in proportion to their rank, we would be very foolish not to adopt a definite system for our titles. To call both ranks of Surgeons by the same title is a mistake, to call both grades of Surgeon-Major by the same title is a mistake. If a title means anything it means different grades of rank, and if we adopt the same title for two different grades it is wrong.

The title "Surgeon-General," retained for the officers ranking with Brigadier-Generals and Major-Generals is true in principle,

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[1] By General Order 3 of 1880, the undress plain black belts were discontinued by all ranks.

[2] Granted by General Order 3, of 1880.

the title "Deputy Surgeon-General" is like all three-worded titles too cumbersome. They should be called Surgeon-Colonel, which everyone understands.

The title "Surgeon-Major," as at present used, should be reserved for those ranking with Majors and not used for the higher grade. A distinct and definite title should be given for each grade in military rank and the affix "Surgeon" or "Doctor" added to it.

The rank and file of the army always speak of the Major-Doctor and the General-Doctor in common parlance. The title Surgeon is never used at any time, except officially. Every medical officer is considered to be a doctor.

(74) (*K*) *Rank.*—As regards rank, we will always be unsatisfied while two things exist. One is while the senior Surgeons-Major are *junior of the rank* as Lieutenant-Colonels,[1] and the other while the Deputy Surgeons-General rank with Lieutenant-Colonels only.[2] The former grade will under the new system be at the head of large garrison hospitals, and it is absurd to keep these junior of their rank with no prospect of any further rise. In no other department does the "junior of the rank" system obtain.

For the latter their now most important duties in arranging the medical duties of divisions of the army require that they should get extra position, and they should rank as Colonels from the date of their appointment, and retain that rank throughout their service in the grade. Sooner or later both these demands must be met. The reason why the Surgeons-Major were made junior of the rank was to suit the regimental system and prevent the medical officer being senior in the army to his Lieutenant-Colonel. That reason does not now exist.

(75) (*L*) *Custody of Stores and Rationing.*—For the hospital rationing and custody of all equipments, and medical stores in general hospitals and throughout the department, quartermasters of the Army Hospital Corps should be appointed to act under the senior medical officer.

Without some encouragement to the Army Hospital Corps in the way of commissions it would suffer much in *morale.* These officers would carry on their duties as in a regiment, and under them quartermaster-serjeants of the corps would be trained for duty with small section hospitals. Introducing all titles like "stewards" and

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[1] This invidious distinction removed by Royal Warrant of November 27, 1879.

[2] Granted relative rank of Colonel by Royal Warrant, April 28, 1876.

such like which are not used elsewhere in the army is wrong in principle, because soldiers do not understand them and they cause confusion.

We cannot copy too closely the system that works in the regiments. Uniformity is a great comfort if it can be achieved. On this principle, paymasters of the Army Hospital Corps should be so commissioned if needed to carry on the payment of the entire hospital department, &c. The quartermaster otherwise would superintend the payments, but the senior medical officer should be responsible. A hospital should draw its supplies from the Supply Department, in just the same way as a regiment does.[1] In India officials of the subordinate medical department of that country should discharge all the purveying duties, whether as regards rationing, custody of stores, or any other duty, under the responsibility of the medical officer in charge of garrisons, brigades, or divisions.

(76) (*M*) *Principal Medical Officer's Staff.*—As every officer commanding an Artillery district, or commanding a battalion, has an adjutant to act as secretary and assistant, every medical officer administering a division of the army, or a district in England, should have a medical officer as staff officer or adjutant to him. To assist in carrying out the medical administration of a large body of troops such an officer is quite necessary; and it would be a capital training for the younger officers in administration. He should be called either the Medical Staff Officer or the Surgeon-Adjutant of the district. In all large hospitals the senior medical officer would of course nominate one of the junior officers to act as adjutant and conduct the routine duties of the administration. He would not be excused from any duty on that head, but an officer is required to intervene between the administrator and the rank and file of the orderlies and patients, &c., &c. Military medical officers will see that this is a necessity.

(77) (*N*) *Roster of Moves.*—Definite rules as regards moves and change of station should be laid down. A roster should be kept and all moves should go by rotation as far as possible. Constant movings and knocking about the country was the great drawback of the old staff system, and by proper administration it should be reduced to a minimum. For all duties on the march the young men under six years' service should be generally taken to teach them experience. A good Principal Medical Officer will always avoid needless

[1] Now the rule, 1878.

moves. In the hands of a weak man constant changes might occur unless some system was adopted defining his powers.

(78) (*O*) *Pay*.—We will always be an expensive corps to keep up. All good things are dear and bad medical officers are dear at any price. Our pay in India until promoted to Surgeon-Major is very bad and greatly below the amount it ought to be. The rise in pay given us by the Warrant of 1867 has not taken effect up to the present day in India. All medical officers ranking as Field Officers should be allowed forage as a part of their pay. The allowance to the young officers at Netley should be raised to the pay of a Surgeon.[1] They do work equal to one and it is a shame to let them be paid at a lower rate than sub-lieutenants are paid at.

(79) When we remember that we come into the army fully educated as medical men, and able if we choose to seek employment in civil life, we must always be more highly paid than the military department who receive all their training at government expense.

All Engineer officers are so taught at Brompton, and the Staff College, the advanced artillery class and Sandhurst are kept up at great cost to the state to teach officers at government expense. All this is saved in the Medical Department. Add on further the expense of the garrison instruction now going on throughout the army to the cost of the pay of the military department, and it will about double the charge against the state. This is never estimated. We are trained at our own cost, and it seems fair that we should demand either a second course at Netley before promotion, or six months' leave on full pay during our service to study in the civil schools. Considering our real value and that for us there are no good things like army staff billets, our services are reckoned at a very low figure indeed, with reference to the value of professional knowledge in the market. The whole charge of the Medical Corps can be and is estimated in one place. The apparently small pay of the military department is really much increased by staff and extra allowances.

(80) As regards pensions to widows it is necessary to note that the widows of all medical officers who die during epidemics should draw the higher rate of pension granted for widows of officers dying in the field. Epidemics are our campaigns. In like manner Queen's Cadetships should be granted to their sons.[2]

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[1] Raised to 8s. under Royal Warrant of November 24, 1879.

[2] Now granted.

The State should found Queen's Cadetships for medical officers' orphans at the Medical Schools, to enable them to enter the service in which their fathers died.

(81) The young medical officers should be compelled to join the Army Medical Officers' Widows' Fund, for the first five years of their service; if after that time they are so foolish as to discontinue, they will do so with their eyes open. Great pressure should be exercised by the senior officers on this head.

(82) (*P*) The Geneva Cross Flag should always be flown over the hospitals even during peace. Our soldiers are so stolid that without this they would never recognize it in war. It should be painted on the ambulance waggons and on the hospital marquees. In every possible place it should be conspicuous. In India it should be the badge of the hospital establishment simply as a distinguishing mark. Our Indian enemies did not sign the convention at Geneva.

(83) (*Q*) Servants from the Army Hospital Corps should be provided for all medical officers serving at home, and the servants' allowance withdrawn. It is quite wrong to allow the non-regimental medical officers to be without soldier servants. In the field they sicken and die for want of food and attendance, and a medical officer is far too valuable to be thus expended.

Servants are not wanted in the West Indies, China, Ceylon and India, and the increase to the corps would be quite nominal. There will always be some men in it unfit for orderlies, and they should be so employed. If need be the cost of an orderly over an ordinary soldier could be paid by the medical officer. It is about fourpence a day.

(84) (*R*) The Departmental Blue-book should become the life-blood of the department. It is now with its rather old statistics of regimental sickness little read. It should be published quarterly as the returns come in, and if India be late or Hongkong behindhand, let their returns be published in the next number. We live too quickly nowadays to read the statistics of 1872 in the year 1875. All regimental statistics too are of little use; we want station statistics. Few officers will now write for the Blue-book. It is too slow in its appearance. If published in smaller portions quarterly it would succeed. There is a great fund of knowledge in the department if it were properly gotten at, and we very much want a paper or journal for the purpose. The Blue-book should be that journal.

(85) (*S*) The whole question of sitting on military boards should

be reconsidered.[1] It would be far better to let us go back to the old system of sitting as members of the boards than to continue the present one of attending them. Many of the boards do not need any medical officers at all.

(86) (*T*) Lectures to the rank and file of the army on sanitary and medical subjects should be given at intervals during the year. The men take to them very kindly, and are eager listeners. It is a little trouble, but it does much good.

(87) (*U*) In certain barracks quarters should be specially told off for the medical officers and lettered accordingly.[2] It is done for the Control service and we should also have it. It saves friction very much. What will be required are officers' quarters and mess rooms near the garrison hospitals.

(88) (*V*) As a rule when the medical officer in charge of the regiment is junior to the officer in charge of the station hospital, he should be employed there under the orders of the Principal Medical Officer in addition to his regimental duties. In small detachments the one officer will perform both regimental and hospital medical duties.

(89) (*W*) The following Army List corrections are needed. The Honorary Physicians and Surgeons to the Queen to be placed under the Queen's Aides-de-Camp, and not in their present absurd position.[3] The appointment is given as an "Honor and Reward" and should be placed under that head. The letters H.P. (Honorary Physician) or H.S. (Honorary Surgeon) should be placed after their names in the departmental list, like the letters A. D. C. after the Queen's Aides-de-Camp. The right of private entrée has doubtless been given these officers in consideration of their honorary post.

(90) The names of the Deputy Surgeon-Generals in India should be added under the names of the Principal Medical Officers of each Presidency in the list of army staff at the beginning of the book. If every Brigade Major is named surely every Deputy Surgeon-General should be so.

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[1] By Army Order 56 of 1897, the instructions regarding the "attendance" of a departmental officer on a Board, when it happened that "his rank corresponded to a rank superior" to that of the President, were abolished; but it was not until the appearance of Army Order 209 of 1912 that all reference to the system under which a medical officer "attended," instead of being a member of a Board, disappeared from the *King's Regulations*.

[2] Granted 1876.

[3] This carried out under Secretary of State's Instructions, on Royal Warrant of November 27, 1879.

Army Medical Officers will note in Hart's Army List the following omissions. The Honorary Physicians and Surgeons to the Queen are omitted from special entry. The Director-General's name and the headquarters staff at Whitehall-yard are omitted in the list of army staff at the beginning of the book. The names of principal medical officers of districts and commands are omitted, although entered in the official Army List. The Army Medical School at Netley is omitted, although Woolwich and Sandhurst are entered. This needs no comment.

(91) The names of the British Medical Department in the Bombay Presidency Army List should be placed before the Bombay Medical Department, the former being the senior corps. The names of the senior medical officers of stations to be entered in the station staff lists at the back of the Bengal Army List.

(92) (*X*) It still remains for consideration if an organization similar to the Royal Artillery could not be given us. By separating us into units of field hospitals with the doctors permanently working with each hospital, we might thus have the Base hospitals like the Garrison Brigades, the Field Hospitals like the Field Brigades and the Ambulances like the Horse Artillery. No insuperable obstacle prevents this being done.

(93) (*Y*) A graduated system of fines for neglect of duty, as now used with such advantage in cases of drunkenness in the army, would suit admirably as a disciplinary measure for the Hospital Corps, and for all irregularities in Army Hospitals.

Whether an Army Hospital stands on Aldershot Common, on the plains of Flanders, in a mango-tope in Oude, or amongst New Zealand fern thickets, it should be self-contained, perfectly complete in every way,—as easily moveable and as independent as a battery of field artillery, and have within its establishment every want provided for. The more nearly this ideal is attained, the nearer is efficiency.

Conclusion.

(94) Little now remains to be said. It is necessary on this question to be patient. In England, and particularly in the army, all change is brought about slowly, but in the end all will be well. One hundred and fifty years of Regimental systems did nothing for us. Let us try ten years of unification. No one will dispute that the old system was abolished in a seemingly harsh way, and that it

caused pain to many people. Old associations torn asunder are always painful, and we know that the captive long confined learned even to love his prison-house and felt at first homeless when freed.

A better day is in store for us. Higher medical culture, freer room to work, and a truer professional and army basis to work upon, are all bound up with the unification system, and they are great things to achieve. In many ways the grievances put forward by some medical officers are quite illogical. They refuse to undertake any responsibility apart from prescribing. A battery commander might with equal sense say, "My duty is to fight my guns and that alone." To him I reply, "Your duty is to fight your guns doubtless, but to be able to do so, you must look after your horses, train your men, and see to the interior economy of your battery." To the army medical officer I say, "Your duty is doubtless to treat the sick; to do so thoroughly, you must see to the hospital administration, train the attendants, organize the staff, look after the rationing; this is your true duty." If gentlemen object to do this, civil practice offers them a wide extensive field for work; in the military service they are rather in the way. It is wholly impossible to carry out their theories and be efficient or independent. If the regimental system exists the regimental commander must have the fullest powers, and that brings back all the old friction, and certain disaster in the field. If the medical department are to be independent, they must be responsible and must undertake *all* the work. There can be no medium course. With the new system properly working, we can, on medical grounds at any rate, go on a campaign "with a light heart"; working under the old system, nothing but constant dread of a crash could be our anticipations.

(95) We build too much for our European efficiency in every department of the army on Peninsular tradition, and Indian victories. From India we may in some European campaign one day learn the lesson that France learned from Algeria, and of the Peninsula few experiences apply to-day. What we want is a system in consonance with modern requirements, and that is the "Unification" one. Any other is striving to fill the round hole with the square block.

(96) To the officers of the military and of the medical departments of the army I would say, "Have no fear that under the new system we will grow less interested or less bound up with the soldier and the service than we have been in the past." No organization can change our nature, and we have come into the

army freely and for the love of it. Other officers often join the army because it is the only profession open to them, and often when very young, while their tastes are still unformed. Not so with us, we can if we choose find other walks of life, but we come to the service when mature in years and of our own freewill. That means that our sympathies are with it. No department in the service has ever been or can ever be so cordially, so intimately bound up with the soldier as we. We have been with the army in every danger and in every success during the past, and we will be with them in every one that is to come. We alone of all the departments have been at all times with the army, and must always be with it. Remember neither the Royal Artillery nor the Royal Engineers, nor the Control department, nor the Chaplains' department ever came to India until 1857, and even now the two latter do not serve there. We on the contrary have borne our share in every Indian campaign, from Plassey to Magdala, and in every other quarter of the globe as well.

All we ask for is a fair field; untrammel us from petty regulations; clear away the forms that seem to keep us up, but drag us down and make us against our will helpless and weak; give us our way, and in the campaigns and epidemics that are to come, we will do, as we have often done in the past, good and trusty service for the army and the country. Amongst the thousand graves that lie to-day uncared for on the heights before Sebastopol are the tombs of sixty officers of the Army Medical Department, who fell by disease and wounds in that most lamentable campaign.

The same spirit of loyal devotion to duty that animated them animates us to-day, and we are ready now to do as they did.

Contented when justly dealt with and when receiving that equal share of the rewards which we no less than the bravest soldier in the army earn at the risk of our lives, we will in the day of trial do our utmost, and men can do no more.

NOTE.—It should be explained with reference to para. (37) on p. 639, that *regimental* medical officers took precedence in their hospitals over *staff* medical officers who were senior to them, only when they were of the same grade. If a Staff Surgeon or Staff Surgeon-Major were appointed to temporary duty with a regiment he superseded all regimental Assistant Surgeons.

Reviews.

PALUDISM. No. 5, September, 1912.

This periodical publication of the *Transactions* of the Central Committee for the Study of Malaria in India, contains a very full epitome of current literature on the subject. Among the original articles of more general interest Lalor reports from Burma the finding of a small fly of the family Chironomidæ, genus Ceratopogon, which is parasitic on adult anophelines, especially *Nyssorhynchus fulginosus*, 6 per cent of which were infested. The fly is usually found on the abdomen of the anopheline with its proboscis sunk into the abdomen from which it sucks blood; it is also found fixed to the nape of the neck with its proboscis buried in the eye. Stanton found a fly of the same genus parasitic on adult anophelines in Kuala Lumpur, and suggests the possibility of such blood-sucking flies playing a part in the spread of malaria. Fearnside appears to have first noted flies attached to the abdomen of culicine mosquitoes in 1900 (*Indian Medical Gazette*, vol. xxxv, 1900, p. 128).

Fry has a note on the indigenous fish of Bengal which prey on mosquito larvæ. Such fish are constantly found in permanent collections of water. There are numerous varieties, of which *Haplochilus panchax* is the most frequent. From observation on permanent collections of water he found that those free of weeds, with clean cut sides without grass or bush, were always free of larvæ if fish were present, while under opposite conditions larvæ were abundant. He concludes that without adequate protection from fish, mosquito larvæ cannot exist and that there are enough indigenous fish in Bengal to deal with larvæ without any necessity to import "*millions.*" The use of larvicides on permanent collections of water is deprecated on account of the risk of destroying fish. Fry suggests that we should recognise that borrow pits are a necessary part of engineering works, and that we should aim at having them made deep so that they will not dry up and kill the fish; he would have the people who make borrow pits held responsible for their maintenance in a sanitary condition, free of weeds and with clean cut sides.

Perry recommends the use of diluted bile on slides used as a support for dissecting mosquitoes. Slides treated in this way allow the water to run freely over them, and obviate the difficulties due to surface tension on greasy slides where the fine structures are apt to float about and get mixed up with the rest of the dissection. A drop of bile is spread over the slide and the water put on; the same slide will do for many dissections without further treatment with bile.

Maud L. Davy describes the anophelines found in Quetta; she discovered five varieties, viz.: *Myzomyia culicifacies, Neocellia Stephensi, Palagiamyia Lindesayi, Pyretophorus Nursei*, and *P. nigrifasciatus*. The rise in malaria in Quetta corresponded to the rise in the numbers of *M. culicifacies* and *N. Stephensi*.

Jacob describes a method for calculating the number of red blood

corpuscles in a microscopic field from the number which are cut by a line drawn through the diameter. The formula is:—

$$N = \frac{\pi}{4} \quad \frac{D}{d} \quad N_c$$

where N is the number of red cells in the field, D the diameter of the field, d the average diameter of the red cells, and N_c the number of red corpuscles which are cut by a line drawn through the diameter. The calculated error with four observations is 6·7 per cent, and is, of course, less the greater the number of fields counted. The formula seems likely to be useful in other work than malaria—the counting of vaccines, for example. W. S. H.

SIMPLE LECTURES ON NURSING FOR SOLDIERS IN INDIA. By M. R. Truman, Q.A.M.N.S.I. Allahabad: The Pioneer Press, 1912. Pp. 89.

This little book of 89 pages, as stated in the preface, "is written in the hope that it way prove useful to the various classes of soldiers in India who annually undergo a course of training in nursing duties, to enable them to nurse their sick comrades." The chapters dealing with nursing proper are written simply and in plain language, and will be found useful to those who use the book. As the volume is written for men who do not undergo the prolonged and systematic training which the nursing section of the Royal Army Medical Corps do, we think that there is much unnecessary matter dealt with. For example, in our opinion it is not necessary for soldiers who are undergoing such a limited period of instruction to be acquainted with the pharmaceutical signs used in prescribing. In addition some errors are made in describing the symbol used, and also in the Latin abbreviations, e.g., *vide* p. 15, "Gg or Ss stands for half, as ℥igg = $1\frac{1}{2}$ ounce." P. 16, "post crib = after meals," and "anti crib = before meals." The chapters dealing with nursing detail are written clearly and convey useful information, but in Chapter V, "Observations," &c., p. 32, the directions given for placing the patient on the operating table are difficult to follow, presumably due to some error in printing. Directions are also given in the same chapter as to the dilution of concentrated lotions. We do not think that such a responsible duty should be entrusted to the nursing orderly. It should be done by a more highly qualified individual. The subsequent chapters dealing with enteric and other fevers, as regards the nursing proper, observation of symptoms, &c., are good, but we think that again some unnecessary matter has been included, and information stated which perhaps is somewhat misleading. Enteric fever, it is stated "is generally contracted from a microbe in water, milk, *fruit, and from bad smells and drains*." Nothing is mentioned about the common house fly as a carrier, or infected dust. Dysentery is stated to be often caused by a chill, or caught sitting on cold stones, &c. These surely are predisposing causes. The chapters on Burns, Scalds, Drowning are useful and practical, but there is no mention made of Schäfer's method for the restoration of the apparently drowned, Silvester's method only being described. The chapters on Fractures, &c., Wounds and Hæmorrhage are plainly and concisely written, and are quite suitable for their purpose.

The chapter on Poisons is simple and well arranged, and the subject

is dealt with in an understandable and practical manner. There is a useful chapter on "Cooking for Invalids," with which the book concludes. To sum up, the book as regards the purely nursing aspect is well suited for the purpose for which it is written, and will doubtless be of great service to those who study it. As mentioned above, some unnecessary matter has been introduced. Finally, we think that the expression "Medical Officer" should be adhered to throughout; the use of "Doctor" and "Medical man" being omitted, especially as these nursing lectures are intended for soldiers training as nursing orderlies. F. M. M.

PRACTICAL ANATOMY. The Student's Dissecting Manual. By F. G. Parsons, F.R.C.S., and William Wright, F.R.C.S. London: Edward Arnold. Vol. i, pp. viii and 467, 8s. 6d. net. Vol. ii, pp. vii and 382, 8s. 6d. net.

The authors of this manual have attempted a bold innovation in their treatment of this subject, and are to be heartily congratulated on their temerity.

They state, in the preface, that the book was undertaken with the idea of leaving out as many facts of anatomy as they dared. The result of this audacity is an excellent account of all the important structures of the body, unburdened by a mass of unimportant detail.

There are over two hundred excellent illustrations, of which most are semi-diagrammatic in character, so that the descriptions of complex regions and those parts containing nerves and vessels are made more clear by these supplements to the text.

The formation of the hip and knee-joints are fully and thoroughly dealt with, due emphasis being apportioned to the synovial pouches in the vicinity of these joints.

The chapters devoted to the abdominal and pelvic viscera are clearly written, and a full description is given of all the essential structures which are included in the category of abdominal contents.

Viewing these two volumes comprehensively, there are very few anatomical facts which do not here find mention, and scarcely a region of any import which is not thoroughly described. We can thoroughly recommend these volumes to those preparing for an examination in this subject. J. W. H. H.

SYPHILOLOGY AND VENEREAL DISEASE. By C. F. Marshall, M.D., M.Sc., F.R.C.S. London: Baillière, Tindall and Cox. Second Edition. Pp. xii and 560. Price 10s. 6d. net.

This work was first published in 1906, and the author states in the preface to the present edition that the time seems ripe to take stock of recent work which has been done in syphilology and venereology. This includes the Wassermann reaction, cutaneous reactions in syphilis and gonorrhœa, the treatment of syphilis with organic preparations of arsenic and the vaccine treatment of gonorrhœa, all of which are dealt with in the last 52 pages. The first part of the book is devoted to a detailed description of the signs, symptoms and treatment of syphilis, acquired and hereditary, and of gonorrhœa and its complications as they affect each separate portion of the body. In revising this portion of his book the author does not seem to have been impressed by the practical utility

of recent work as an aid to diagnosis. Even the demonstration of the *Spirochæta pallida* is not considered worthy of a place in the diagnosis of syphilitic chancre from soft chancre. Instead we find the usual more or less unreliable diagnostic table, followed by the usual qualifying statement that soft and syphilitic chancre may coexist. The author evidently thinks the presence of Ducrey's bacillus a point of some diagnostic value, but his attitude towards the demonstration of the *S. pallida* as a means of diagnosis is not revealed till he comes to deal with the treatment of syphilis 252 pages further on, when he writes: "It is to be hoped that the search for the *S. pallida* (if this continues to hold its position as the pathogenic microbe of syphilis) in cases of doubtful chancre will help to put an end to the method of procrastination in the treatment of syphilis which is still practised by certain surgeons." A very commendable sentiment, but one which loses some of its value by the insertion of the portion in brackets.

The later chapters, which deal with recent work on syphilis, cannot be commended for their practical utility. The working of the dark-ground apparatus is dismissed in half a page of generalities, with practically no details of any assistance. In the chapter which deals with the serum diagnosis of syphilis we are told that sensitized corpuscles are cells which have been washed to free them from plasma, and Noguchi's modification (at least we assume the author is referring to Noguchi's, though he speaks of it as Yamanouchi's) is classed with such modifications as Bauer's and Hecht's as one which may give a positive reaction with a non-syphilitic serum and cannot be used quantitatively. This stricture is not justified in view of the fact that Noguchi adheres to the principles of the original method, and only differs in details which are designed to improve on its reliability and delicacy.

On the whole, we think it would have been better if the author had delayed the production of this edition a few years longer in order to allow him time to make up his mind more definitely about the value of the latest work on syphilis. In our judgment this is too important to be dealt with fairly in 86 pages of selected extracts from the works of other authors. L. W. H.

A Practical Text-book of the Diseases of Women. By Arthur H. N. Lewers, M.D.Lond., F.R.C.P.Lond. Seventh Edition. London: H. K. Lewis, 1912. Pp. xi and 540. Price 12s. 6d. net.

The clinical and practical characters of this book have been retained in the same form as the previous editions. The section on Cancer has been carefully revised and amplified. Several good micro-photographs have been added, and a full description of Wertheim's hysterectomy included. Chapter X, which deals with Fibroid Tumours, is too compressed, the degenerations and other changes to which these tumours are liable being very little discussed. The author's opinions (p. 208) as to the malignant degeneration of fibroids are not those commonly accepted. In view of Professor Leith's recent researches on the "sarcomatous degeneration of multiple fibromata of the uterus" some mention of this interesting condition might reasonably have been expected in a work of this nature.

The book can be recommended to the student of "diseases of women,"

for whom it is written, but is somewhat too curtailed for the use of Captains R.A.M.C. going in for the Specialist's Examination in Midwifery and Gynæcology. R. H. F.

STRETCHER DRILL AND FLAG SIGNALLING FOR WOMEN. By Henry W. Spaight, Hon. Surgeon and Supt. S. J. A. Brigade. Lauder and Son, Helston. Price 3d., 21 pp.

This little manual gives a simple form of stretcher drill suitable for women's voluntary aid detachments. Semaphore and Morse signalling are also briefly explained. It should be most useful for instructors and members of women's voluntary aid detachments. C. E. P.

Current Literature.

Cultivation of Malarial Parasites in Vitro.—Bass and Foster (*Journ. Exp. Med.*, October, 1912, p. 567) have obtained growths of plasmodia obtained from twenty-nine malignant tertian, from six benign tertian cases and from one quartan case of ague. Laveran observed parasites in hanging drops of malarial blood for ten days after its abstraction. Sakharov, Rosenbach, Blumer, Hamburger and Mitchel noted that the plasmodia lived for several days in the blood which leeches had drawn from ague patients. Bass and Foster take blood from a vein at the bend of the elbow, mix it with one hundredth of its volume of a 50 per cent. watery solution of dextrose (Merck), defibrinate it by gently stirring with a glass rod, and incubate at 40° C. The plasmodia grow on the surface of the precipitated cells in a layer $\frac{1}{50}$ to $\frac{1}{20}$ of an inch thick. Those below die. A rather coarse needle should be used for drawing the blood since aspiration through a fine capillary tube injures the parasites. It is necessary to avoid the admixture of air. For subcultures, the leucocytes must be removed, since the merozoites on leaving the corpuscles are englobed by the white cells. The defibrinated blood is centrifugalized until most of the leucocytes are on the surface of the clot. The supernatant serum is withdrawn, and is distributed in small test tubes ($\frac{1}{2}$ by 5 in.) to the extent of about a $\frac{1}{2}$ to 1 in. column in each. A tenth of a cubic centimetre of red blood cells and plasmodia is taken up from the middle zone of the centrifugalized blood, and is placed at the bottom of the serum in the culture tubes. It is advantageous to make use of flat-bottomed tubes, or in their absence discs of filter paper supported on rings of glass tubing may be used to receive the layer of cells. Subcultures should be made every forty-eight hours. The plasmodia grow in the red corpuscles. They are destroyed in a few minutes by human serum from any source. They can exist in red cells immersed in Locke's fluid without the calcium chloride. Locke's fluid is a solution of the salts which occur in blood, in the proportion in which they are present. The asexual cycles *in vivo* and *in vitro* are identical. The sexual forms do not appear to grow in cultures. The *Plasmodium vivax* and

P. falciparum are distinct species. The latter is easier to cultivate. The generation period may vary from thirty hours to four days according to the temperature at which the cultures are incubated. Calcium salts added to cultures of the malignant tertian parasite cause lysis of the infected corpuscles. The authors suggest that hæmoglobinuria may arise from an excess of lime in the blood. They state that hæmoglobinuria has disappeared from certain localities when lime-free water has been substituted for a lime containing supply. C. B.

Vaccine Treatment of Typhoid Fever.—In an article entitled "The Vaccine Treatment of Typhoid Fever," in the *Medical Record* of June 24, 1911, Dr. James G. Callison, Instructor in Clinical Microscopy and Vaccine Therapy, New York, Post-Graduate Medical School and Hospital, gives an account of the treatment of a series of twenty-four cases of typhoid fever by means of vaccines derived from three different sources. One was a polyvalent vaccine made from seven recently isolated strains; one was a commercial product; while the third was the ordinary prophylactic vaccine in use in the U. S. Army.

Thirteen cases were treated with the first, two with the second, and nine with the last.

Apart from subcutaneous injections of the vaccines the cases were treated by what may be called the usual routine methods. His conclusions are as follows:—

(1) The production of antibodies or protective substances in response to the inoculation of a vaccine follows definite fixed laws, regardless of whether the vaccine is given for prophylactic or curative purposes, and the results in treatment must be interpreted in the light of what is known of those laws.

(2) Inoculations of vaccine in typhoid fever prevent relapses and lessen complications, and in some cases probably shorten the original attack.

(3) Stock vaccines should be given in preference to autogenous vaccines in typhoid fever. The older the culture the better.

(4) When given in therapeutic doses such stock vaccines are without injurious effect, and do not interfere with other treatment.

(5) The routine treatment should be continued until the fever process is controlled by the vaccines.

(6) The dosage used by many of those who have treated typhoid with vaccines in the past has been too small to secure the best possible results.

(7) Every case of typhoid fever should receive vaccine treatment as soon as a diagnosis is made, and this should be continued until the temperature becomes normal or it is demonstrated that the case will not respond to this form of therapy.

With the majority of these conclusions, we think, most observers will be inclined to agree, but there are some of them which merit a little further consideration.

In reference to the first, Callison begins his paper with a discussion on the blood changes produced in a normal man by the injection of vaccine for prophylactic purposes, largely based on the work of Leishman and others in 1904, and the later work of a similar nature by Russell, of the United States Army, by whom it was shown that the formation of antibodies begins as a rule about the eighth or ninth day after injection. Taking

this in conjunction with the fact that in an attack of the disease, antibodies cannot be demonstrated in the blood of the patient until after the lapse of a similar period, he makes an assumption which may be considered as scarcely justified in the present state of knowledge, viz., that when these two actions are proceeding simultaneously in the human organism, as, for instance, when the patient is treated with vaccine, the same interval will elapse between the therapeutic injection of the vaccine and the response in the blood. It must, we think, be considered as at least a possibility that the tissues during the course of an infection are in a condition of increased susceptibility to the typhoid poison using this term in its widest sense, and that in such a case the interval between inoculation and response may be either shortened or lengthened, probably depending on a balancing of the size of the dose on the one hand and the severity of the infection on the other.

Some clinical evidence of a shortening of the latent period shown in response to an injection within a few hours or a few days was seen in a series of cases reported from India (JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, 1909, xii, p. 136). It may be said, however, that such speculations are probably of little value, and that the question can only be settled by careful observations of the blood content in antitropic substances in a case under treatment with the vaccine.

As regards the choice of vaccine, Callison is satisfied that the advantage lies with a stock vaccine for two main reasons, viz.: (*a*) It is always at hand and so ready for use the moment the case is diagnosed. (The necessity for beginning the treatment early is agreed on by all.) (*b*) For the making of such a vaccine a strain is usually chosen which is low in toxicity or virulence, while its antibody-forming powers are high.

Though we are in agreement on these points they raise the question, also discussed by Callison, as to the rationale of the use of vaccine in treatment, and here we are not in such complete accord. Callison's view is that the patient is suffering from a localized and a blood infection, and that by subcutaneous injection of vaccine he, the patient, receives the advantage of both intravenous and subcutaneous inoculation, the former being of admittedly less value experimentally *qua* the production of antibodies than the latter. It appears to us that too much stress is laid on the infection of the blood which may be considered to represent nothing more than an overflow into it of bacilli produced at the local nidus, and so practicably negligible.

The view we should be inclined to advance is that during the course of the infection we have multiplying at the local nidus virulent bacteria with the toxic element well in the ascendant, while the antibody-forming powers are at a low ebb. By the subcutaneous injection of bacterial bodies derived from a strain chosen as above, we produce what may be called a complementary action. We, in fact, establish another manufactory whence issue substances of slight toxic action though powerful in bactericidal, opsonic, and possibly other bodies of an antitropic nature.

The amount to be given as a dose is also dealt with. Callison's dosage has varied from 25 to 1,000 millions, and he now recommends an initial dose of 300 millions. Subsequent doses are given at three or four day intervals, with an increase of 100 millions at each dose. He, however, makes no claim that this dosage or this spacing is the best. It may be noted that these doses and spacing agree closely with those

arrived at in the Indian series referred to above, but the point is one that needs much further investigation, and until it has been determined quantitatively by means of repeated blood examinations for each stock vaccine used in the treatment of cases, what is its power of causing the formation of antibodies and of beneficially influencing the clinical course of the disease, the question must remain open.

As to the results obtained by Callison, three cases out of his series of twenty-four are excluded for various reasons, leaving twenty-one, among which there were one relapse and three deaths, giving a case mortality of 12·5 per cent.

In the series of cases treated in India, the case mortality rate was 8·3 per cent., and a criticism made at the time was to the effect that, owing to the well-known variability of the virulence of typhoid epidemics, the results obtained by other workers in this field were necessary to the formation of a sound opinion as to the effect of vaccine treatment on the mortality rate. This criticism is to some extent replied to by a table which appears in Callison's communication, and which gives the results of twenty-two observers recording a total of 323 cases from different parts of the world. In these 323 cases there were seventeen deaths, a case mortality rate of 5·2 per cent. By what appears to be a similar method of treatment Chantemesse has obtained a death-rate of 4·6 per cent in 1,303 cases.

Both of these show a very marked diminution of death-rate as compared with that obtained by the ordinary routine methods of treatment, *i.e.*, where dependence is placed on the unaided resisting powers of the patient, and may, we think, be taken as evidence that these attempts at a "specific" treatment of the disease do effect some good. They certainly point to the desirability of extended trial of the method and emphasize the need for investigation of the blood changes brought about by the therapeutic inoculations of such vaccines. A. B. S.

Gonococcal Vaccine as a Means of Diagnosis.—Reg. Arzt Dr. Lederer (*Wien. med. Wochen.*, No. 40, 1912) has published a short account of some work which he carried out conjointly with Hecht. As antigen he used arthigon purchased commercially, as this has the advantage of being standardized. As complement 0·05 cc. of guinea pig's serum was used for each tube containing 0·2 cc. of inactivated patient's serum. Some preliminary tests had shown that 0·25 cc. of arthigon alone did not fix the complement. Varying amounts of arthigon from 0·2 cc. to 0·5 cc. were therefore employed. In almost all cases of extensions of the gonorrhœal infection to other parts as also with acute posterior urethritis, a marked positive reaction was obtained; in pure anterior urethritis the reaction was usually negative.

An attempt to obtain a cutaneous reaction by injecting a concentrated gonococcal vaccine was not successful. C. E. P.

Inclusions in the Leucocytes of Scarlet Fever. — Doehle (*Berl. klin. Wochen.*, August 19, 1912, p. 1,636), observed bodies in the leucocytes of the blood of scarlet fever patients, when films were stained with Michaelis, azur blue; Pappenheim, methyl green; Pyronine, or Manson's borax, methylene blue. They are polymorphores, and sometimes appear as dots or dashes, rods, or commas. Kretzschmar confirmed

Doehle's findings. In only four out of seventy control blood films did he discover similar structures.

Harriehausen examined the blood of 86 scarlet fever patients. He found inclusions in 76 to 100 per cent. of leucocytes in 16 cases; in 34 to 66 per cent. of the leucocytes in 7; in 1 to 33 per cent. of the leucocytes in 33; and no inclusions in 29 patients. They are present in largest numbers during the height of the pyrexia, and disappear with the subsidence of the fever; they are absent in abortive cases. Unfortunately they are not specific. Harriehausen detected these bodies in films of blood derived from patients suffering from tubercle, pneumonia, empyema, bronchiectasis, whooping cough, and serum rashes. Hence he thinks that their presence is of small diagnostic significance. C. B.

The Mode of Transmission of Spirillum Fever by the Pediculus.—Nicolle, Blaizot, and Conseil (*Compt. rend de l'Acad. des Sci.*, July 19, 1912, p. 1,636) were unable to induce the spirillum fever in men or animals by the bites of lice which had fed on infected patients or animals. One person submitted to the attacks of 4,707 pediculi which had sucked spirochæte-infected blood one to twenty-five days previously. If the lice be examined immediately after their infecting repast, numerous spirochætes are seen, but seven or eight hours later they disappear. On the eighth to the twelfth days they reappear, and continue to the nineteenth day. These spirilla are virulent. A monkey inoculated intraperitoneally with an emulsion of a crushed pediculus which had been infected a fortnight before, contracted the fever after an incubation period of four days. Though the bite of such pediculi is harmless, yet its dejecta are virulent and the host inoculates himself while he is scratching the irritable spot. Two crushed lice which had fed on an infected monkey nine days previously were rubbed gently into a slightly abraded area of skin of a man. Five days later he developed fever.

Two crushed infected lice were placed on the conjunctiva of another man. He contracted the disease after an incubation period of seven days.

The infection in both these patients was cut short by salvarsan. Ova which had been deposited twelve to twenty days after the infecting meal were placed in a moist chamber at 28° C. They began to hatch on the seventh day. Fifty-five larvæ and twenty eggs were emulsified and introduced into the peritoneal cavity of a monkey. This animal became infected and showed signs of the disease ten days after the inoculation.

The *Pediculus capitis* can always convey the disease. Lice, therefore, are the agents of transmission of spirillum fever. In them the infection is hereditary. C. B.

The Destruction of Bugs in Barracks.—Oberstabsarzt Professor Bischoff (*Deut. militärärzt. Zeit.*, September 20, 1912), after discussing the unsatisfactory methods at present employed for the destruction of bugs in barrack-rooms, describes a newly invented apparatus which he has tested and found to be most satisfactory.

The insecticide employed is called "Salforkose"; it consists mainly of bisulphide of carbon, with some formaldehyde. The manufacturers state that there are two other secret components, one of which is added to increase the destructive properties of the mixture, and the other for

the purpose of reducing the risk of explosion. The fluid is well shaken and then poured into a specially constructed iron vessel supported on tripod legs, and a light applied to the mixture by means of a long taper. The fluid burns briskly and gives off intense fumes with the characteristic smell of burning sulphur. Before using it all air inlets in the room must be carefully sealed up, wardrobes and chests of drawers should be opened, and all articles so arranged as to permit free access of the gases. One apparatus should be employed for each 3,500 cubic feet of space to be disinfected; the quantity of "Salforkose" required for this space is 2 litres (3·5 pints). The gases should be allowed to act for six hours, when all insect life will have been destroyed; at the end of this time the room should be opened up and ventilated for half an hour before being again occupied. Numbers of dead insects will be found lying on the floor, but beds, &c., should be taken to pieces and the interstices brushed out to remove any dead insects. The apparatus costs £2, and the fluid "Salforkose," 1s. 6d. per kilogramme. The cost for a room accommodating ten to twelve men is therefore, roughly, 6s. Extensive tests were also carried out in the emigrant department of the Hamburg Amerika Shipping Company. These gave full satisfaction in regard to the destruction of insect life, but apparently had little or no influence on bacteria. C. E. P.

Affections of the Nervous System after Salvarsan.—Benario (*Münch. med. Wochen.*, No. 40, p. 2172, 1912) criticizes some reported cases of severe affections of the nerves after injections of salvarsan. He quoted three cases reported by Vollert, each of which had only had one injection of salvarsan, the dose of which, moreover, was not stated, and concludes from the published history of the cases that the optic neuritis was due to insufficiently treated syphilis and not to salvarsan. At the Neurologists' Congress in Frankfort, 1911, Ehrlich pointed out that in secondary cases of syphilis unless the patient will consent to a full and energetic course of treatment it is wiser not to give any salvarsan at all. With reference to the occurrence of pure syphilitic affections of the eyes, Fehr reported that in the ophthalmic department of the Virchow hospital, 2,636 persons were examined before receiving injections of salvarsan; in 217 cases (= 8·23 per cent) syphilitic changes in the eyes were found. None of these cases had applied for treatment for eye trouble. In 41 of the cases early optic neuritis was present, and in 17 others some affection of the optic nerve was noted, *i.e.*, in 2·2 per cent of the persons examined the optic nerve was affected by syphilis.

Of the persons examined prior to receiving an injection of salvarsan, only 451 subsequently attended the eye department. Of these 340 had normal eyes before the injection, and 111 had shown some syphilitic change. Among the 340 who had normal eyes before receiving an injection of salvarsan, 32 had developed some affection of the eyes subsequent to being treated by salvarsan. The percentage of patients who developed optic neuritis after salvarsan treatment was 2·4, or almost exactly the same as that found among patients examined before treatment.

In the other departments of the hospital, salvarsan treatment of syphilis had not yet been introduced, yet these departments sent fourteen cases of optic neuritis for treatment in the eye department. Ehrlich has repeatedly pointed out that in well-developed secondary

syphilis a single injection of salvarsan cannot possibly cure the disease, and is likely to aggravate any syphilitic affection of the nervous system. C. E. P.

The Treatment of Small-pox by Tincture of Iodine.—Newell (*Indian Medical Gazette*, September, 1912, p. 352) reported most satisfactory results from the application of tincture of iodine, especially in early cases of confluent small-pox. The B.P. tincture was painted over exposed surfaces, *e.g.*, chin, neck, forehead, and backs of hands, two or three times daily for a few days and then entirely discontinued. The development of the pox was materially retarded and no pitting ensued; the severity of the illness was also reduced. The most important advantage is that when treating natives who refuse to go to hospital, the exposed surfaces are disinfected, thus lessening the chances of aerial infection. C. E. P.

The Destruction of Mosquitoes by Spraying.—Giemsa (*Arch. f. Schiffs- u. Trop. Hyg.*, August, 1912, p. 565) atomizes by means of an ordinary garden-syringe spray the following mixture, diluted to twenty times its bulk with water.

Tincture of pyrethrum (prepared by extracting 20 parts of powdered pyrethrum in 100 parts of methylated spirit)	580 parts by weight
Soft soap	180 ,, ,,
Glycerine	240 ,, ,,

He states that this method is effective for the destruction of mosquitoes and other flies. C. B.

Destruction of Mosquitoes by Pyrethrum. (Extract from the Report of the Department of Sanitation of the Isthmian Canal Commission for the month of July, 1912.)

REPORT OF BOARD OF HEALTH LABORATORY.

"During some recent experimental work with pyrethrum as fumigant for mosquitoes, an economical mode of ignition was devised, whereby the pyrethrum was completely incinerated and the full value of its effect obtained. When this fumigant is burned in the usual manner, in iron pots, there is an underlying layer of powder in the bottom of the pot which is out of contact with oxygen, is covered with ash, and fails to be consumed. This layer is 10 to 15 per cent of the total amount of the powder used.

"If, however, a layer of sawdust 2 or 3 in. thick is placed in the bottom of the pot, in the form of a crater, and the pyrethrum laid on the top of this, the ensuing ignition is most complete, for in this instance air is supplied from below through the interstices of the sawdust, and thus permits complete combustion of the fumigant. When the cost of pyrethrum is considered, the saving of 10 or 15 per cent in this way is well worth accomplishing when fumigation is done on a large scale. Recent tests with this method have shown that mosquitoes may be killed with quantities of pyrethrum less than one-third of that required by the United States Army standards when exposed to its fumes for two hours."

. . . .

"SANITATION: CANAL ZONE.

"Owing to topographical changes due to new construction work, the area of antimalarial work has been considerably extended over that of July, 1911. This is particularly true of the territory between Balboa and Pedro Miguel, at Culebra, and from Las Cascadas northward to the Chagres River. Numerous breeding places have also been created in the concrete work at the locks and their approaches at Gatun, Pedro Miguel, and Miraflores. Storage yards for supplies are also breeding areas, the control of which is only partially successful, owing to the difficulty of oiling such places.

"New construction work at Balboa has created many new breeding places, and as a result more adult anopheles have been noted in the barracks than during the previous month, and the malarial cases have increased about threefold.

"At Corozal, Paraiso, Empire, and Las Cascadas, the number of anopheles caught at barracks has decreased considerably as compared with the previous month.

"Additional work has been necessary in the large pond at the west of the Pedro Miguel locks, also on the berms of the canal near Culebra, and in the completed portion of the canal between Bas Obispo and Las Cascadas. The low ground near the Gatun reservoir has been eliminated by filling up as an anopheles breeding area.

"Less vegetation has been removed in some districts than in 1911, due to the fact that anopheles breeding areas are under control. At some stations nearly all the employees are living in non-screened houses, and consequently are more exposed to malarial infection than those living in screened quarters. The malarial rate, however, is the lowest on record for July since antimalarial work was started.

"As a rule the highest monthly sick rate occurs in July. The malarial cases admitted to hospitals is taken as an index of health conditions on the zone. Culex adults have increased throughout the zone. The rainfall was normal for this season of the year.

The following table shows the malarial sick rate for July, 1907, the year in which it was the highest, and for the months of July, 1911, and July, 1912:—

MALARIA SICK RATE, BY WEEKS (JULY, 1907, HIGHEST).

July 6, 1907	1·27 per cent
„ 13, „	1·18 „
„ 20, „	1·34 „
„ 27, „	1·52 „
July 8, 1911	1·06 „
„ 15, „	0·97 „
„ 22, „	1·11 „
„ 29, „	0·97 „
July 6, 1912	0·47 „
„ 13, „	0·58 „
„ 20, „	0·41 „
„ 27, „	0·47 „

Mastisol.—Stabsarzt Dr. Krebser, attached to Professor Hofmeister's Surgical Division, of the Karl-Olga Hospital, Stuttgart, has published an article (*Beitr. zur Klin. Chir.*, Bd. 79, h. 1., 1912) on the "Use of Mastisol as a Dressing for Wounds." Mastisol is a solution of mastiche in benzol; this does not cause any irritation, as sometimes happened with

the earlier solution in chloroform, but takes longer to evaporate. When dressing a wound, the mastisol solution is painted on the surrounding skin, without any previous washing, and allowed to evaporate for twenty to thirty seconds. A sterile dressing is then applied to the wound. v. Oettingen uses a gauze dressing consisting of four layers of gauze, in the centre of which is a smaller pad of gauze containing absorbent cotton wool. The large piece of gauze is folded over the pad so that the four points meet in the centre, somewhat like the back of an envelope. The whole is sterilized. On applying the dressing only the outer surface need be touched, the flaps are lifted and the sterile pad applied to the wound. v. Oettingen, who used this dressing extensively in his field hospital during the battle of Mukden, claims that mastisol acts by: (1) Fixing the bacteria in the skin. (2) Hindering the growth of organisms, by preventing the access of moisture. (3) Killing many of the micro-organisms. (4) Not interfering with the exudation from the wounds, as this escapes freely through the dressings without affecting the skin, which is rendered waterproof by the resinous varnish.

In Professor Hofmeister's clinic, mastisol has been in general use since 1911. In no case has it caused any irritation of the skin. The dressings were prepared by the ward sister, and cost on an average about one farthing. Mastisol was also used to retain drainage tubes in position by wrapping some gauze round them and sticking this to the skin. In cases of accidental wounds, visible dirt was removed; when the skin was engrained with dirt it was painted with a solution of iodine in benzine, but no washing or other cleansing was undertaken; hæmorrhage was first stopped by pressure. The mastisol solution was painted on the dirty skin, over dried blood or over a hairy surface, and the dressing applied. The dressing is held firmly in position but can be removed by taking hold of one corner and pulling it parallel to the skin; after removal, when the wound has healed, the skin can be cleansed with benzine.

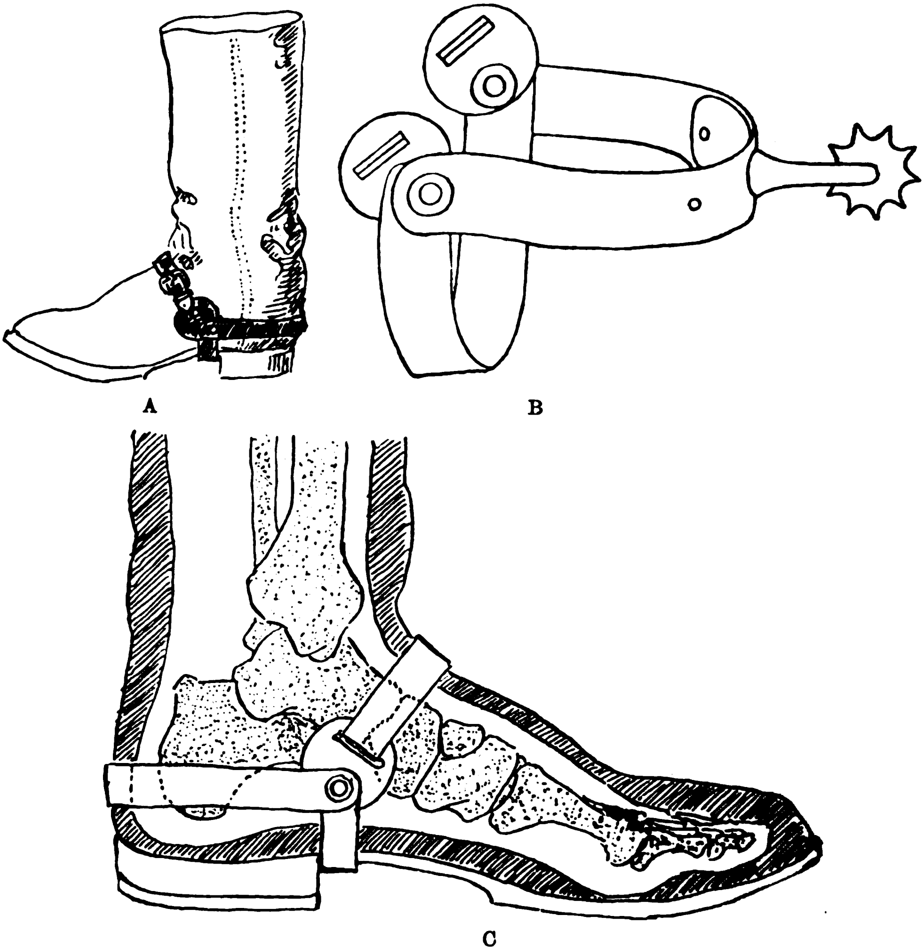
Hofmeister has used the mastisol dressing in about 4,000 cases, including set operations and accidental wounds. In the out-patient department, 959 accidental wounds were treated with mastisol, all healed aseptically except seventeen, and of 167 wounds admitted to hospital all healed without suppurating except five. When suppuration occurred it was probably due to faulty technique.

Mastisol is also useful when applying extension to a limb, or again in cases of furunculosis its application tends to limit the spread of infection. In the treatment of accidental wounds the great advantages of a mastisol dressing are that no painful cleansing is required; the procedure is simple and rapidly carried out; the dressings cannot shift, it affords protection from septic infection, and the cost is very low.

C. E. P.

Iodine Solution for Skin Disinfection.—Marine Stabsarzt Dr. Scheel has designed a special bottle for holding tincture of iodine so that it may always be ready for use. The bottle is made of thick deeply-tinted glass with a wide mouth. The stopper is prolonged in the form of a thick glass rod reaching nearly to the bottom of the bottle. At the lower end of the stopper a pad of asbestos is attached. To disinfect the skin the stopper is taken out and the tincture of iodine spread by means of the asbestos pad. He claims that with this bottle the iodine solution is always ready for use and that there is little wastage. C. E. P.

A New Form of Foot Protector.—Oberstabsarzt Prof. Dr. Bischoff (*Deut. militärärzt.-Zeit.*, p. 561, August 5, 1912) has an interesting paper on the results obtained in a battalion of Prussian Guards when using a new pattern of foot protector. The device was designed by Captain



A. Apparatus in position on boot.
B. Apparatus adapted for cavalry.
C. Foot sketched from a skiagram.

Hinkel, of the Landwehr, for his own comfort when shooting, and is intended to prevent the foot from chafing against the boot. The protector was tried during a thirty-mile army marching competition carrying the full service load, in the summer of 1911, and gave most satisfactory results. One man especially, who, owing to too large boots, became lame

and unable to march at the end of the first six miles, when given one of the foot protectors was able to finish the remaining twenty-four miles.

Owing to the favourable reports received, Bischoff obtained 200 pairs of these protectors, and tried them on selected men during the manœuvres. The results were most satisfactory, both in regard to preventing the occurrence of blistered feet, and also in enabling men who had developed blisters to continue marching. The device not only prevents gliding movements of the feet inside boots which are too large, but also supports the arch of the foot, and so delays the onset of foot tiredness.

The apparatus consists of two bands of steel, the longer fits round the top of the heel, and is joined by a movable joint to the shorter one, which passes under the instep. A leather strap across the dorsum of the foot fixes the apparatus in place. This strap must not be pulled too tight. It is made in five sizes. When properly fitted, the two steel bands should make an angle of 90°.

The importance of blistered feet as a cause of inefficiency may be gauged by the experience of the German army at the beginning of the Franco-Prussian war. The number of men who had to leave the ranks for sore feet was excessive. Depots were formed where these men were collected and treated for three days. Those not fit to return to duty at the end of this time were sent to hospital for further treatment. In the month of August the German forces numbered 780,752 men; of these, 3,270 = 4·2 per 1,000 had to be admitted to hospital for blistered feet.

(In the German army the long boot is worn; this boot allows much more play for the foot inside the boot than is the case with our lace boot.) C. E. P.

Instruction in Hygiene in Austrian Cadet Schools.—Dr. v. Hosing, Senior Medical Officer of the Cadet School at Lemberg (*Militärarzt*, No. 18, 1912), has published a paper dealing with the instruction given to the cadets on sexual hygiene. The instruction is given by the medical officer. Cadets in their first year receive a few elementary lectures in sexual functions and reproduction of species generally; those in their second year receive a more advanced course of instruction on the same subject. Cadets in their third and fourth years are fully instructed as to venereal diseases, the risk of contracting infection from prostitutes and the advantages of continence. The senior cadets who care to apply for it are also instructed in personal prophylaxis after exposure to infection.

Prior to this instruction being given, there were usually about seven cases of venereal disease among the cadets annually, equal to a ratio of 35 per 1,000 of strength. Since these lectures have been instituted, only three cases have occurred in five years. C. E. P.

Australian Army Medical Corps.—(Extract from the Report of the Director-General for the year ending June 30, 1911.)—The strength of the Australian Army Medical Corps was 806, of whom 737 completed the training, and were reported "efficient." The training at present consists of eight days' continuous training in camp, ten whole day parades, ten half-day parades, and four night parades. The D.G., A.A.M.C., states that this does not afford sufficient time for efficient training in all the duties of the corps, and he has proposed an increase in the number of parades. With the exception of Victoria, schools of instruction have been established in all the States.

Combatant officers of the Citizen Forces have to pass an examination in sanitation before promotion to Captain. Out of 154 candidates, only twenty failed to pass.

In accordance with the scheme of Universal Military Training, 152,995 names were registered to the end of June, 1911; of these 101,795 were medically examined, and 95,465 = 93·7 per cent. were found fit. The tables giving the average measurements of recruits for the militia show good all-round physical development. C. E. P.

Austrian Red Cross Society's Vehicles.—The Austrian Army Order, No. 161, dated August 28, 1912 (V.O.B.H., September 7, 1912), defines the conditions under which vehicles provided by the Austrian Red Cross Society to assist the Army Medical Service in war will be employed. The wagons will be detailed to various medical units and reserve depots, and will be placed under the absolute control of the senior medical officer with the unit. The wagons will be marked with a definite number corresponding to the unit to which they are allotted.

In peace time the vehicles will be stored at the places at which their units are mobilized, either in the Society's or in army buildings. Except in Vienna and Brunn, where the Society has its own depot, the wagons will be under the care of the Army authorities; but the Society's delegates may inspect them at intervals. The Society will pay for the up-keep of the vehicles.

When mobilized, a separate inventory will be kept for wagons belonging to the Red Cross Society, which will also pay for all repairs. On demobilization the wagons will be returned to the places at which they are mobilized. An appendix gives a list of the equipment which must be provided with each wagon. C. E. P.

Red Cross Society, Württemberg.—The following notes are taken from the annual report of the Württemberg division of the German Red Cross Society for the year 1911 (*Der. Deut. Kolonnenführer*, September 1, 1912). In the case of mobilization the division has a hospital detachment consisting of 62 male nurses and 41 female nurses and cooks, and an equipped ambulance train with 31 wagons, capable of transporting 250 patients from the front to their homes. The division also has 97 trained male nurses and 226 female nurses available for fortress hospitals. The division can also provide 39 auxiliary hospitals with a total of 3,841 beds; in addition, it has arranged for beds in civil and private hospitals in various localities affording accommodation for a total of 7,668 beds. There are now 26 detachments with a total personnel of 1,392 men. The Committee for equipment appointed three sub-committees to undertake the equipment of the ambulance train; the women's sub-committee undertook to provide the necessary linen, &c. The Nursing Committee instituted a number of training classes for nurses. The Organization Committee founded several new branches during the year. The total funds of the division amounted to £24,400.

C. E. P.

Voluntary Aid Detachment Headquarters in Germany.—At the annual meeting of representatives of the voluntary aid detachments (*Der Deut. Kolonnenführer*, No. 17, 1912), Arendt read a paper on the

"Advantages to a Voluntary Aid Detachment of possessing its own Headquarter house"; this facilitates the teaching, promotes social intercourse, and gives a sense of solidity to the organization. He gave a sketch of the existing headquarter buildings in eighteen towns. Most of the buildings have cost from £1,000 to £3,000, and the funds were obtained partly by subscription, but largely from the proceeds of lotteries. In many cases the municipal authorities have given the land for the building without making any charge. In Nuremberg the buildings have cost over £13,000, while those in Munich are valued at £19,000. In designing a V. A. D. headquarter building in a large city, Arendt advised the following arrangement:—

On the ground floor a large hall for drill purposes with a smaller hall for lectures adjoining it; these two should be separated by a removable partition. On the first floor there should be a model room and a library, also store-rooms for uniform and equipment. The upper floor can be used as quarters for a resident member of the voluntary aid detachment. A large room or shed adjoining the courtyard is also required in which to store equipment for the adaptation of railway trains, stretchers, &c. In the basement a small workshop in which to practice the improvisation of apparatus is very desirable. A useful addition is a small loan store from which articles required for nursing serious cases of illness can be lent gratis to poor people. C. E. P.

Correspondence.

HEAT STROKE.

TO THE EDITOR OF "THE JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—With reference to the article by Major Ogilvie in the issue of our Journal for October, which, I presume, was written for the purpose of inviting discussion on a most important subject, I venture to make the following remarks with a view to furthering that object, by abler pens than mine.

To begin with: Is there no control exercised by the nerve centres over the heat-producing functions of the lungs and the blood? Has the liver no compensating power in modifying the heat-producing apparatus?

I confess that I am unable to accept the inference that evaporation is the only means by which the heat of the body is controlled. I have seen patients in whom a great disappointment and mental worry, while exposed to heat, by no means extreme, and to average physical exhaustion in a fairly dry atmosphere, was followed by a fatal result ascribed to "heat stroke," and I have regarded these cases as caused by nervous exhaustion. On the other hand, I have seen other cases in which there has been more or less a history of alcohol, or of malaise attributable to disturbance of

the alimentary tract, in which it is reasonable to suppose that the functions of the liver had been impaired.

As regards spinal pads, I have experienced personally the greatest possible comfort from one on a long march travelling East, in the afternoon, and the greatest possible discomfort and consequent exhaustion from the want of one.

I strongly recommend men who are exposed to a powerful sun and dry air to wear thick clothes rather than too thin ones. In moist air, the sun's direct heat is not nearly so powerful. I speak again from personal experience.

Finally, I may explain that I am not one of those who are afraid of the sun. When a man is in normal health and not over-fatigued, the sun will not hurt him if he be suitably clothed.

W. Rainsford,
Colonel, Retired Pay.

THE FIRST BEARER CORPS OR COMPANY.

TO THE EDITOR OF "THE JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

Sir,—Two articles on this subject have appeared in the Journal (vol. xvi, p. 563, and vol. xvii, p. 412). These interesting articles refer to what are called the first and second bearer companies respectively, and imply that the first organized bearer corps or company dates from 1879.

In the course of a historical research undertaken originally as to quite a different subject, I have come across a historical fact which suggests that we should date the inception of a bearer corps on an organized basis, not from 1879 but from 1806. The fact is this: On February 27, 1806, an order was issued from Camp, Chouldry, in Madras, by Lieut.-General Sir S. F. Cradock, authorizing the formation of a bearer corps to meet the difficulties experienced by the armies, then operating in Mysore, in coping with the removal of wounded and sick. The order specifically mentions the unit as a bearer corps, and directs that men be enlisted specially for employment in the carriage of dhoolies for the conveyance of the sick and wounded, or as cauvedy carriers for the carriage of hospital stores. The order then goes on to say that the bearers were to be formed into companies, each company to consist of one head maistry, three second maistries and ninety men. Three such companies were to be formed, and the whole Corps placed under the command of a European officer. The order does not say whether the officer was to be a medical officer or not.

The men were to be enlisted in the same manner as sepoys, and to have the same privileges as regards prize money, family certificates and

pensions. The pay of the head maistries was fixed at four pagodas, that of the second maistries at three pagodas, and that of the men at one pagoda thirty-four fanams. In the currency of that day forty-two fanams went to a pagoda, and the pagoda was equivalent to three and a half rupees.

This order appears to me to be of unusual interest, not only historically, but as indicating the existence of official appreciation of the need in 1806 of an organized *cadre* to deal with the sick and wounded transport problem. With India, in 1912, practically devoid of any such *cadres* to face the same problem, a knowledge of this historical fact seems to me of the first importance. A reference to this order is made by Wilson, in his "History of the Madras Army" (vol. iii, p. 167). I have verified the reference and seen a copy of the original order.

I am, &c.,

Simla, R. H. FIRTH,
October 24, 1912. *Colonel.*

"THE SIMPLE LIFE."

TO THE EDITOR OF "THE JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—May I be permitted the opportunity of making a mild reply to the critics of my article under the above heading? The authors have adopted a *nom de plume*, and therefore are unknown to me, but on reading their communication some obvious deductions may be made.

From the levity with which they have approached the subject I feel sure that they are young and enthusiastic; their communication shows signs of the exhilaration produced by the stimulus of uric acid on organs, the tissues of which have not yet started those degenerative processes from the dire effects of which it was my hope to defend them.

Secondly, their "optimistic outlook on life" is, at present, in a state of unnatural activity; but let them remember that stimulation is followed by depression. Their present enviable state of mind is to be deduced from their euphemistic synonym "moderate eaters," unless it be that the printer left out the syllable "im" before the adjective.

But the most serious sign, that I note in the letter, is the advice to take exercise and purgatives. My contention was that the excessive use of these artificial palliatives of their gustatory excesses, among army officers, was to be deprecated as causing a loss of energy to the State. A failure on the part of my critics to grasp this fact appears to be an indication that their cerebration, at any rate, is already becoming lethargic; might it be suggested that they are becoming less discreet

than they think in partaking of "the absurdities" which we mutually deplore?

These are evidences that they are becoming susceptible to the temptations of "the shop window." Before their account at the bank of indulgence is overdrawn let me remind them *Gutta cavat lapidem non vi sed sæpe cadendo.*

Since they talk lightly of matrimony they are distinguishable as bachelors.

For my personal health let them rest assured; at the College we have a beverage that so lubricates our nitrogen cycles that their good running is certain.

In conclusion, I am confident that many officers will agree, that dinner as a parade should only be taken seriously once a week, and that a meal similar to that usual on Sunday night (perhaps it might be hotter) would be very popular on six of the nights. Guest night would then again be guest night, and not an aggregation of dyspeptics watching, and mentally measuring, every mouthful, in fear of exceeding the limit. I appeal to "the few moderate over-eaters" who have done me the honour to criticize my contribution to start this hygienic reform.

I am, &c.,

M. C. WETHERELL,
Captain R.A.M.C.

Millbank,
November 14, 1912.

INDEX TO VOLUME XIX.

CONTENTS.